MICROSCAN®

MS-820 Industrial Bar Code Scanner User's Manual

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About the 820 Scanner

The MS-820 scanner can decode high density bar code symbols from 3 to 30 inches. Its IP65 and heavy industrial rating makes it ideal for applications such as conveyors, assembly lines, or embedding within machinery.

Its application code resides in an onboard flash memory chip that can be easily updated by downloads.[1] A user interface program, the ESP-MP (Easy Setup Program–Multi-platform), can be downloaded from our web site (***www.microscan.com***) and runs on Microsoft Windows 95™, Windows 98™, Windows NT™, Windows 2000™ operating systems. Alternately, configuration commands can be sent from an embedded, menu-driven terminal program, or directly by host serial command strings.

About This Manual

This manual provides complete information on setting up, installing, and configuring the MS-820 scanner. The chapters are presented in the order in which a scanner might be setup and made ready for industrial operation.

Chapter 1, "Quick Start" provides overall step-by-step instructions for getting your scanner operational with specific "go to" references to other chapters and appendices.

The appendices include specifications, reference tables of serial commands, ASCII characters, multidrop setup and addresses, as well as other useful information relating to bar coding and electrical and mechanical setups for the scanner.

Host Communications

There are three ways the scanner communicates with a host:

1. Microscan's Windows™ based **ESP-MP™** (Easy Setup Program—Multi-Platform), the preferred method which offers point-and-click ease of use and visual responses to user adjustments.
2. Serial commands such as **<Kr1>** can be sent from a terminal program. They can also be sent from the **Terminal** or **Utility** window within ESP-MP.
3. Embedded onboard menus are accessed from a terminal window with a **<D>** command. These menus lack some of the functionality of the ESP-MP, but may be more responsive in older, slower computers.

1. See your Microscan sales representative to access the latest application codes.

Keystrokes

Serial commands, selections inside instructions, and menu defaults are highlighted in **red bold**. Cross-references are highlighted in blue. Web links and outside references are highlighted in ***blue bold italics***. References to menu topics are highlighted in **Bold Initial Caps**. References to topic headings within this manual or other documents are enclosed in quotation marks.

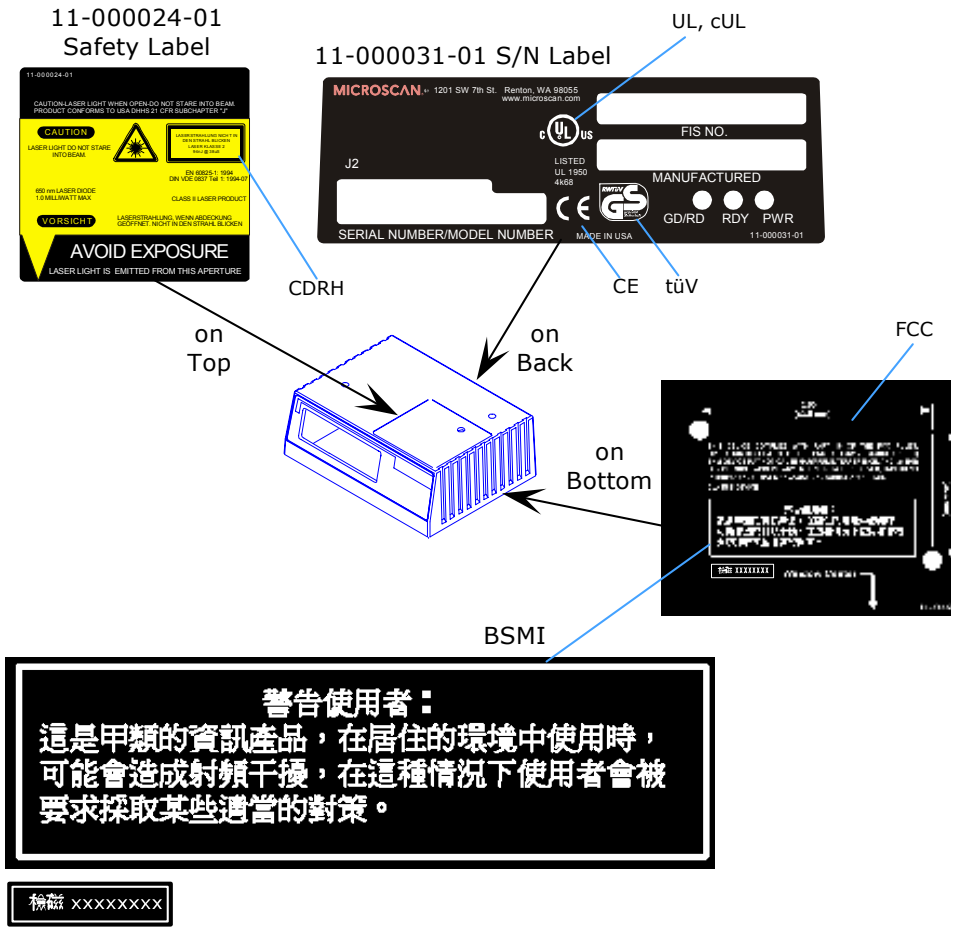
Approvals

This equipment is in compliance or approved by the following organizations:

- CDRH (Center for Devices & Radiological Health)
- UL (Underwriters Laboratories, Inc.)
- cUL (UL mark of Canada)
- TüV (Technischer überwachungs-Verein)
- FCC (Federal Communication Commission)
- CE Compliant
- BSMI (Bureau of Standards, Metrology and Inspection)

Safety Labels

The following labels are located on the side and back of the MS-820 scanner:



Warning and Caution Summary

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

For connection to a UL listed direct plug-in power unit marked Class II and rated 10 to 28 VDC at 2.7 watts or greater.

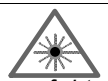
European models must use a similarly rated Class I or Class II power supply that is certified to comply with standard for safety EN 60950.

WARNING

Use of controls, adjustments, or performance of procedures other than those specified herein may result in hazardous laser light radiation exposure.

WARNING

There are no user serviceable parts in the scanner. Opening the scanner voids the Microscan Systems warranty and could expose the user to laser diode power of up to 7 mW.



WARNING

The laser beam can be harmful to eyesight. Avoid eye contact with the laser beam. Never point the beam at other people, or in a direction where people may be passing.

Chapter 1 Quick Start

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This chapter is designed to get your scanner up and running quickly using Microscan's **ESP-MP™** so the user can get a sense of its capabilities and test bar code samples. Detailed setup information for installing the scanner into the actual application can be obtained in the subsequent chapters.

In addition to **ESP**, you can send commands to your scanner by serial commands and through the scanner's embedded menus.

Step 1 — Hardware Required

To get started you will need:

- An MS-820 scanner (**1**).
- A host computer (**2**) with either a terminal communications program or Microscan's ESP™ which runs under Windows™ operating system, Windows-95 or higher, including Windows NT™.
- A null modem configuration cable (**3**) P/N 61-300026-01.[1]
- An IB-131 interface kit (**4**) P/N 98-000014-01 that includes an IB-131 interface module P/N 99-400005-02 and a scanner to interface cable (**5**) P/N 61-000011-01.
- A power supply (**6**) P/N 97-100004-05 (120V) or P/N 97-100004-06 (240V).

Caution: If using your own power supply, be certain that it is wired correctly and supplies voltage is within the +10 to 28VDC limits. Incorrect wiring or voltage can cause software or equipment failures.

Note: An optional object detector P/N 99-4400021-03 (**7**) is shown here.

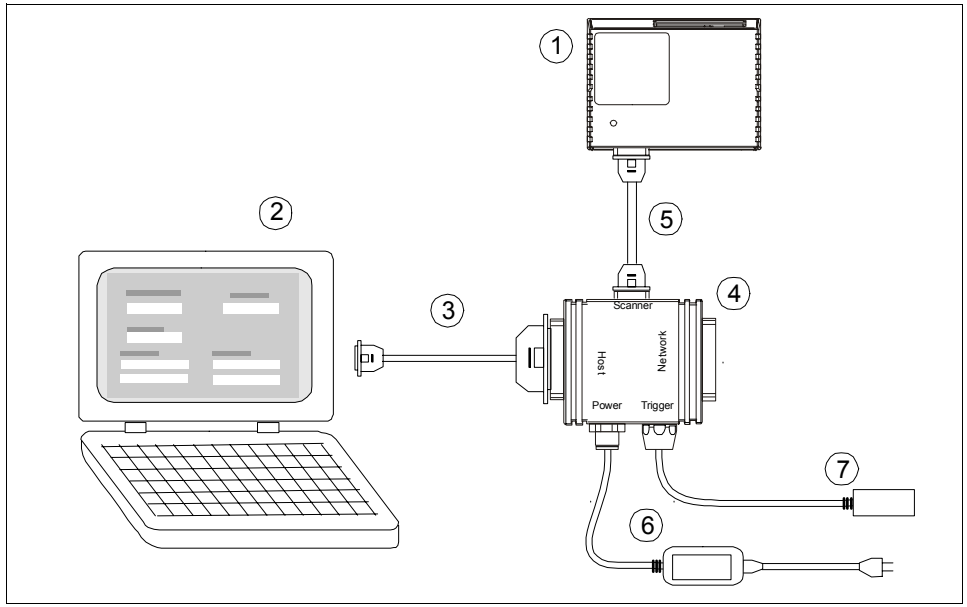


Figure 1-1 Hardware Configuration

1. If using another host cable, make certain it does not have RTS/CTS connected to the host.

Step 2 — Connect the System

1. Connect the scanner to the IB-131 interface box, using the supplied cable with kit P/N 98-000014-01. If making up your own cable, make certain that you connect transmit pins to receive pins.
2. Connect the IB-131's "HOST" 25-pin connector to the computer.[1]

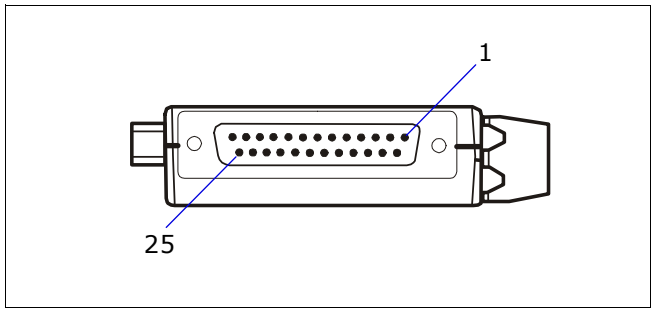


Figure 1-2 Side View of IB-131 showing Host 25-pin Connector

(Refer to "IB-131 Interface Module" on page A-10 for pin connections.)

3. Connect the power supply to the IB-131's POWER connector.
4. Power up the system.

Caution:

1. Be sure all cables are connected **BEFORE** applying power.
2. Always power down **BEFORE** disconnecting any cables.

1. When wiring the IB-131 to a host computer which has a 25-pin connector, cross pins 2 and 3. When wiring the IB-131 to a host computer which has a 9-pin connector, do NOT cross pins 2 and 3.

Step 3 — Install ESP-MP[1]

(**ESP-MP** is short for *Easy Setup Program–Multi-Platform*.)

1. Insert your Microscan CD into your computer's CD drive.
2. Launch **Setup.exe** under **ESP_Software\Multi_Platform** and follow the prompts.[2]

   If downloading from the web:

   a. Go to ***http://www.microscan.com/esp***

   b. Enter company information.

   c. Select **ESP-MP** and download to your computer hard drive.

   d. Extract **ESP-MP WinZip** files to a directory of your choice.
3. Note where your ESP.exe file is stored on your hard drive.

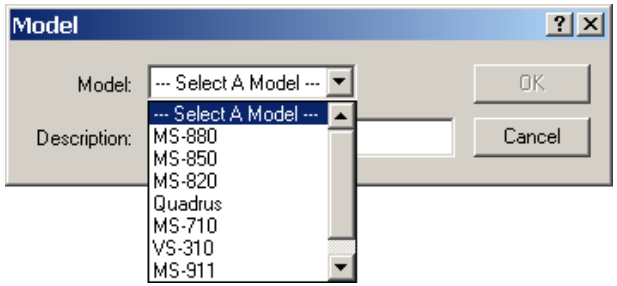
   At the end of the install process, you should see the following icon on your desktop:

4. Click the **ESP-MP** icon to start the program.

1. You can also access the scanner through its embedded menus. See Appendix H — "Embedded Menus."
2. Contact your sales representative

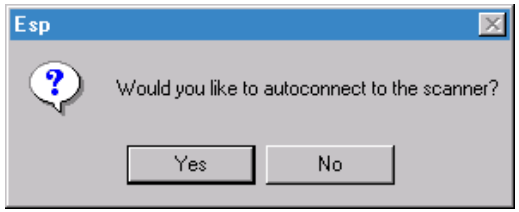
Step 4 — Select Scanner Model

When you start the program, the following dialog box will appear:



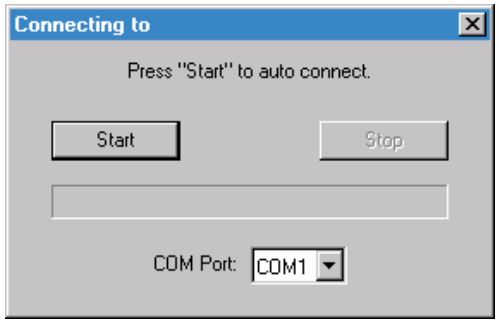
Note: If you need to select another model later, you can find it under **Model Select** in the menu bar.

1. In the model dialog box, select your model.
2. Select the default name, **MS-820-1** or type in a new name of your choice.
3. Click **Yes** when the following dialog on the right appears.



Step 5 — Select the Communications Ports

1. Select your communications port under **COM Port**.



COM1 is typically used for laptops.
COM1 and **COM2** are typically for desktop computers.

2. Click the **Start** button.

Step 6 — Connect with Auto Connect

After clicking the **Start** button in the **Connecting to...** dialog, allow time for the auto connect routine to test all of the combinations. You will see a blue progress bar fill across the **Connecting to...** dialog.

When connected, the **CONNECTED** message will appear in a green box in the status bar on the bottom right of the dialog.

Tip: If you do not see either the CONNECTED or DISCONNECTED message at the bottom of your dialog, try expanding the ESP window horizontally.

Tip: If connection fails, enable a different Com port and try again.

Step 7 — Retrieve Scanner Settings

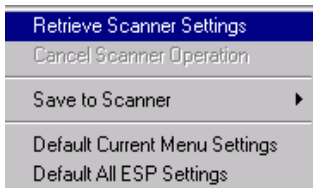
Unless you have unchecked the default **Upload After Autoconnect** under **Options**, all values of the scanner will be loaded automatically and displayed under **ESP Values**.

If **Upload After Autoconnect** is not checked, the scanner values will not be loaded and ESP communications values will remain displayed under the heading, **ESP Values**.

> **Tip**: Before doing **Retrieve Scanner Settings**, you may want to preserve your current ESP settings to your computer as an ESP file by selecting **Save** or **Save As** in the **File** menu.

At any time you can retrieve **ALL** scanner values by:

1. **Right-clicking** anywhere in the configuration window, and
2. Selecting **Retrieve Scanner Settings**.



You can also retrieve settings by clicking on the **Send/Receive** button.

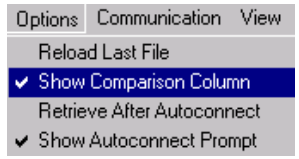
This is useful if you want to:

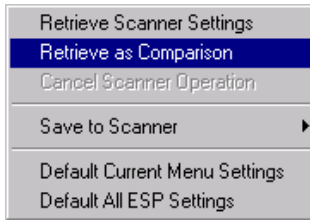
- Copy (upload) the scanner's settings and save them as a computer file for later retrieval.
- Ensure that whenever you save ESP settings to the scanner you are not saving any unwanted changes that you or someone else had made previously in ESP. By first doing **Retrieve Scanner Settings**, you eliminate that possibility.

Step 8 — Compare Scanner Settings

If you want to compare settings in the current scanner side-by-side with those in ESP without changing the ESP values:

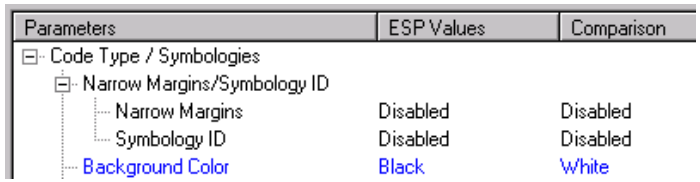
1. Under the pull down Options menu check **Show Comparison Column**.
2. **Right-click** anywhere in the configuration window.
3. Select **Retrieve as Comparison**.





After a short pause the scanner's current settings will be displayed under the **Comparison** column. Compare those settings with the ESP values which are displayed under the **ESP Values** column.

For example, if you change **Background Color** to **Black**, but haven't yet saved this to the scanner, you will see the dissimilar program and scanner values highlighted in blue.



Step 9 — Position Scanner and Symbol

Set up a symbol at the scanning distance you will be using in your application.In positioning the scanner and symbols being scanned, consider the following:

- Avoid bright light or IR light from other sources, including other scanners.
- Pitch or skew label or scanner a minimum of ±15° to avoid specular reflection, the return of direct, non-diffused light.

Note: For additional tips on positioning the scanner and bar code labels, see "Position Scanner and Bar Code" on page A-25.

Note: The position of the scanners shown here is simply a suggested one for quick setup. There are variety of ways to mount the scanner. The important thing is to keep the test bar code label and scanner in the same relative position as shown here. If your manual is on a CD, look for a test label on the back of the CD cover.

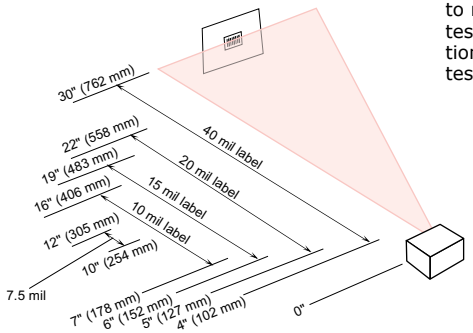


Figure 1-3 Low Density Ranges

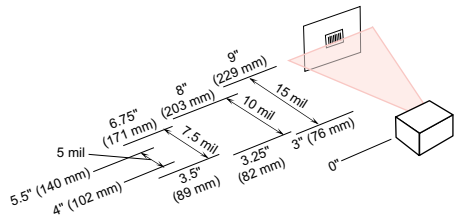
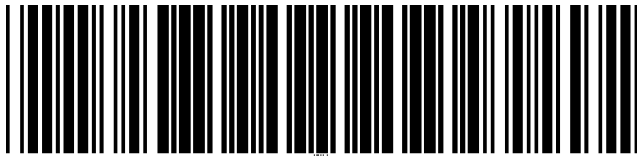


Figure 1-4 High Density Ranges

Code 39 is the default code type enabled. If you are uncertain as to the symbology type, enable all codes, by clicking the **Utilities** menu and enabling **Autodiscriminate** under **Code Types**. If using I 2/5 symbol, you must set the code length. (See Table , "Interleaved 2 of 5," on page 5-14.)

Step 10 — Test Range for Bar Code Label

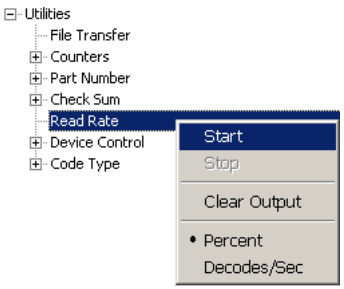
1. Position a label in front of an operational scanner.[1]



20 mil Code 39 Test Symbol
You can also find test symbols on the back of the Microscan Marketing CD jacket. The 20 mil refers to the width of the narrowest bar (e.g., 7.5 mil = .0075" or .1905 mm).

2. Click the **Utilities** button.

3. Right-click **Read Rate** and select **Start.**



4. Observe rate in terminal window on the right of the **Utilities** screen.
5. Move your bar code label towards the scanner and away from the scanner until the decode rates drop off in each direction as shown in figure 1-5.

   This will give you a sense of the depth of field (inner and outer ranges) for your symbol's density and range.
6. To end test, right-click **Read Rate** and select the **Stop** button.

Note: If the scanner is in the default **Continuous Read** mode, it will read and beep repeatedly as long as a readable label remains in the read range and the read cycle configuration has not changed.

Note: See "Formulas for Number of Decodes" on page A-29 for additional information on scan width and depth of field.

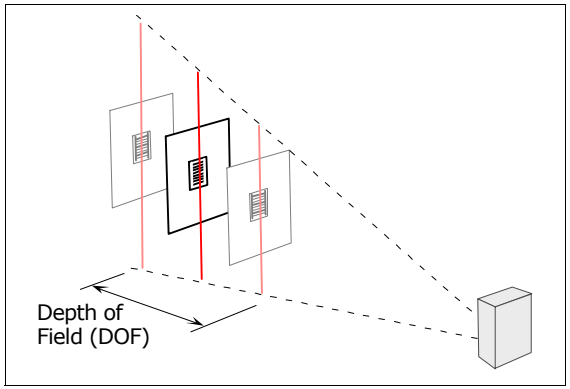


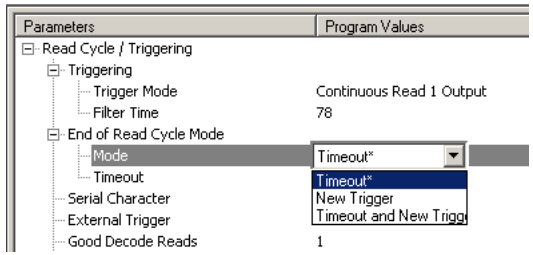
Figure 1-5 Depth of Field

1. If using an I 2/5 label, verify that the number of characters in the label being scanned matches the code length enabled for the I 2/5 code type (default is 10 and 6). See "Interleaved 2 of 5" on page 5-14.

Step 11 — Make Changes to Configuration and Save

To make changes to a configuration setting:

1. **Double-click** the setting (for example, **End of Read Cycle**).



2. Place your pointer in the selection box, scroll down to the setting of your choice and **left-click** on the setting.
3. **Left-click** again anywhere in the configuration window to complete the selection.
4. **Right-click** in the configuration window and select **Save to Scanner** to implement the command in the scanner. You have 3 choices:
   a. **Send, No Save.** This initializes all changes in active memory. These changes will be lost if power to the scanner is cycled.
   b. **Send and Save.** This will cause the scanner to beep, indicating that the change has been implemented and that all changes have been saved to the scanner's NOVRAM for power-on, except factory settings.[1]
   c. **Advanced/Send and Save, Including Factory.** Same as above, except that changes to factory settings will also be saved for power-on.

For **Multidrop** setup, see "Multidrop Communications" on page A-34.
For **Matchcode** setup, see Chapter 7, "Matchcode."
For **Daisy Chain** setup, see "Daisy Chain Mode" on page 2-10.

1. Consult your model specific user's manual for a list of factory settings.

Chapter

2

Communications

Chapter Contents

Host Port Parameters 2-4
RS422 Status 2-5
Auxiliary Port 2-6

This section tells how to setup communications parameters with the host and an auxiliary terminal.

In addition, the options for auxiliary port connections are fully explored.

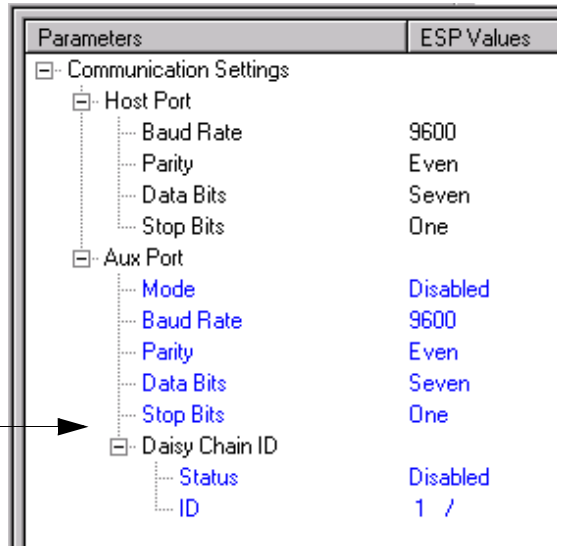
With Microscan's ESP-MP™ (Easy Setup Program) configuration changes can be made in the ESP-MP menus, then sent and saved to your scanner. The user can also send serial commands to the scanner via the ESP's Terminal window.

Note: The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Communications by ESP

Click this button to bring up the **Communications** menu.

To change a setting, **double-click** the setting and use your curser to scroll through the options.



Communications by Serial Command

Command Title	cmds	Format
Host Port Parameters	**Ka**	<**Ka***baud,parity,stop bits,data bits*>
RS422 Status	**Kb**	<**Kb***status*>
Auxiliary Port Parameters	**Ky**	<**Ky***aux port mode,baud,parity,stop bits,data bits,daisy chain status,daisy chain ID*>
Comm. Status Request	**KT?**	<**KT?**>

Communications by Embedded Menu

In addition to ESP-MP, Microscan's scanners have embedded menus that can be accessed from the terminal window in ESP or from a separate terminal program. See "Embedded Menus" on page A-20 for instructions on using the embedded menus.

Send a **<D>** command from your terminal to bring up the main menu:

```
                          MICROSCAN SYSTEMS, INC.
                           CONFIGURATION PROGRAM
                                MAIN MENU
                              35-338201-14
------------------------------------------------------------------------------

   TOPICS                          DESCRIPTIONS

1) COMMUNICATIONS                  HOST PROTOCOL AND HOST PORT.
2) OPERATIONS                      TRIGGERING, TIMEOUTS, ETC.
3) CODE TYPES 1                    CODE 39, PDF417, I 2 OF 5, UPC, CODE 128.
4) CODE TYPES 2                    CODE 93, CODABAR, ETC.
5) GLOBAL CODE PARAMETERS          MARGINS, SYMB.ID., BACKGROUND, AIAG, ETC.
6) SCANNER OUTPUT                  BARCODE,BEEPER,RELAYS,OUTPUT MODES, ETC.
7) SCANNER SETUP                   GAIN,SCAN SPEED,TRANSITION COUNT,ETC.
8) DIAGNOSTICS SETUP               WARNING MESSAGES, OPERATION TIME, ETC.


------------------------------------------------------------------------------
            ESC = MAIN MENU OR EXIT    N  = NEXT ITEM
            M   = PREVIOUS MENU        SP = NEXT ITEM
            B   = PREVIOUS ITEM        CR = THIS ITEM
------------------------------------------------------------------------------
MAIN--> COMMUNICATIONS_
```

Press the return key (**CR**) to see the communications menu:

```
                      CURRENT SETTINGS FOR COMMUNICATIONS
------------------------------------------------------------------------------
HOST PROTOCOL                                 |PARAMETER| HOST PORT| AUX PORT
----------------------------------------------|---------|----------|----------
PROTOCOL  = POINT TO POINT                    |BAUD RATE|  9600    |  9600
PREAMBLE  = DISABLED = <CR><LF><NUL><NUL>     |PARITY   | EVEN     | EVEN
POSTAMBLE = ENABLED  = <CR><LF><RS><SPC>      |STOP BITS| ONE      | ONE
ADDRESS   =                                   |DATA BITS| SEVEN    | SEVEN
RES = <NUL>                                   |PORT MODE| RS232    | N/A
REQ = <NUL>                                   |         |          |
EOT = <NUL>                                   |AUX MODE | N/A      | DISABLED
STX = <NUL>                                   |DAISYCHAIN ID STATUS| DISABLED
ETX = <NUL>                                   |DAISYCHAIN ID DEFINE| 1/
ACK = <NUL>                                   |
NAK = <NUL>                                   |
LRC = DISABLED                                |
RESPONSE TIMEOUT =    12 ms                   |
INTERCHAR DELAY  =     0 ms                   |
------------------------------------------------------------------------------
            ESC = MAIN MENU OR EXIT    N  = NEXT ITEM
            M   = PREVIOUS MENU        SP = NEXT ITEM
            B   = PREVIOUS ITEM        CR = THIS ITEM
------------------------------------------------------------------------------
COMMUNICATIONS--> HOST PROTOCOL
```

Host Port Parameters

Baud Rate, Host Port

Definition: The rate at which the scanner and host transfer data back and forth.

Usage: Can be used to transfer data faster or to match host port settings.

Serial Cmd: <**Ka*baud rate***,*parity,stop bits,data bits*>

Default: **9600**

Options:

0 = 600	3 = 4800	6 = 38.4K
1 = 1200	4 = 9600	7 = 57.6K
2 = 2400	5 = 19.2K	8 = 300

Parity, Host Port

Definition: An error detection routine in which one data bit in each character is set to 1 or 0 so that the total number of 1 bits in the data field is even or odd.

Usage: Only changed if necessary to match host setting.

Serial Cmd: <**Ka***baud rate*,***parity***,*stop bits,data bits*>

Default: **Even**

Options: 0 = None 1 = Even 2 = Odd

Stop Bits, Host Port

Definition: One or two bits added to the end of each character to indicate the end of the character.

Usage: Only changed if necessary to match host setting.

Serial Cmd: <**Ka***baud rate,parity,****stop bits***,data bits*>

Default: **One**

Options: 0 = One 1 = Two

Data Bits, Host Port

Definition: Number of bits in each character.

Usage: Only changed if necessary to match host setting.

Serial Cmd: <**Ka***baud rate,parity,stop bits,****data bits***>

Default: **Seven**

Options: 0 = Seven 1 = Eight

RS422 Status

Definition:	Enables RS422. When RS422 is enabled, RS232 is disabled.
Usage:	Only changed if necessary to match host setting.
Serial Cmd:	<**Kb***status*>
Default:	**Disabled**
Options:	0 = Disabled 1 = Enabled

Auxiliary Port

As with the host port parameters, the auxiliary terminal's settings (baud rate, parity, stop bits, and data bits) must be identical with those of the auxiliary device.

Definition: An auxiliary port connects the scanner to a remote display or to other scanners that can display or transfer data.

Usage: These commands set the communication parameters with the auxiliary port which can be used to configure menus, send data to the host, display data transmissions originating from the host of the scanner, and relay data from other scanners set in tandem (daisy chained).

Note: The aux port cannot be used when the host port is set to RS422 or **Multidrop**.

Auxiliary Port Modes

Definition: Determines the flow of data between the auxiliary port device(s), the scanner, and the host.

Serial Cmd: *<**Ky*** ***aux port mode**,baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID>*

Default: **Disabled**

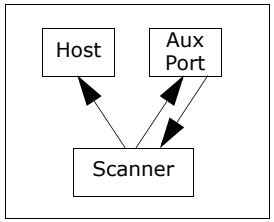
Options:
0 = Disabled
1 = Transparent
2 = Half duplex
3 = Full duplex
4 = Daisy chain

Transparent Mode

Definition: In **Transparent** mode data is passed between the auxiliary port and the host. The scanner buffers data from the auxiliary port and echoes the keyed data on the auxiliary port.

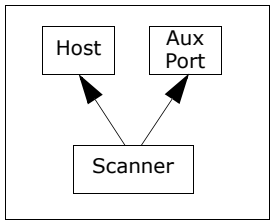
Data initiated from the Auxiliary Port

- Auxiliary port data is passed through to the host whenever a return key is pressed at the auxiliary port or bar code data is sent.
- Whenever aux port data is sent with bar code data, the aux port data will appear between the preamble and the bar code data.
- Auxiliary port data to the host is always sent with a preamble and a postamble.
- If the scanner is in a polled mode to the host, auxiliary port data will NOT pass through.
- **<D>** is the only command accepted by the scanner from the auxiliary port. All other commands will pass through to the host.



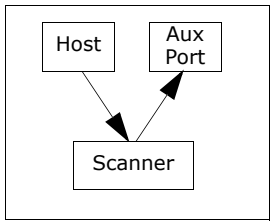
Data initiated from the Scanner

- Transmission to the auxiliary port occurs immediately upon a good read.
- Scan data to the auxiliary port does not include a preamble or a postamble.
- Communications with the auxiliary port is always in Point-to-Point protocol, even if the host is in a polled protocol mode.



Data initiated from the Host

- All host data is echoed to the auxiliary port in unpolled mode.



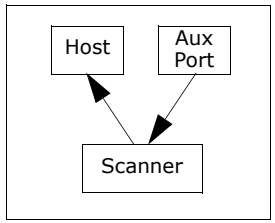
Usage: A common application, in conjunction with handheld scanners, is one that employs an auxiliary readout to detect mis-applied bar code labels.

Serial Cmd: *<**Kyaux port mode**,baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID>*
1 = Transparent

Half Duplex Mode

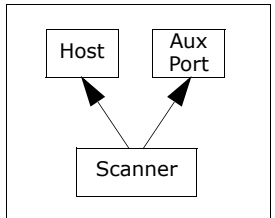
Definition: In **Half Duplex** mode all auxiliary port data and bar code data is sent directly to the host. Bar code data is displayed on the auxiliary port screen at the same time the data is sent to the host.

Data initiated from the Auxiliary Port



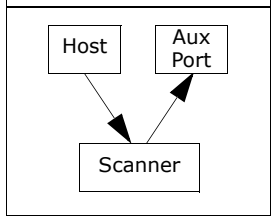
- Auxiliary port data to the host is ignored if the scanner is in a polled mode.
- Auxiliary port data or scanned data is sent to the host whenever it is received.
- Auxiliary port data is not echoed.
- Auxiliary port data to the host is always sent without a preamble or a postamble.
- <D> is the only command that is accepted by the scanner from the auxiliary port. All other commands are passed through to the host.

Data initiated from the Scanner



- Scan data is transmitted to the auxiliary port at the same time it is transmitted to the host.
- Data transmission conforms with all parameters specified in the configuration menu (e.g., **Preamble**, **Postamble**, **End of Read Cycle**).

Data is initiated from the Host



- All host data is echoed to the auxiliary port in unpolled mode.

Usage: Useful when the user wants bar code data displayed on an auxiliary screen close to the scanner.

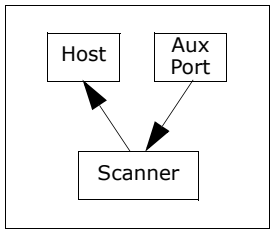
Serial Cmd: <**Ky*aux port mode***,*baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID*>

2 = Half Duplex

Full Duplex Mode

Definition: In **Full Duplex** mode all auxiliary port data and bar code data is sent directly to the host. Bar code data is not displayed on the auxiliary port screen.

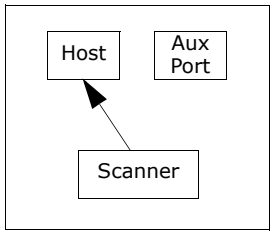
Data initiated from the Auxiliary Port



- Auxiliary port data to the host is ignored if the scanner is in a polled mode.
- Auxiliary port data or scanned data is sent to the host whenever it is received.
- Auxiliary port data is not echoed.
- Auxiliary port data to the host is always sent without a preamble or a postamble.
- <D> is the only command that is accepted by the scanner from the auxiliary port. All other commands are passed through to the host.

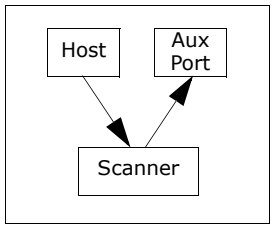
Data initiated from the Scanner

- Scan data is not sent to the auxiliary port.



Data initiated from the Host

- All host data is echoed to the auxiliary port in unpolled mode.



Usage: When communication to and from the auxiliary port is required.

Serial Cmd: *<**Kyaux port mode**,baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID>*

3 = Full duplex

Daisy Chain Mode

Definition: In a daisy chain application, scanners are connected in tandem or "daisy chain" and decoded data is relayed from one scanner to another on up to the host.

A master scanner has its host port linked to the host computer and its auxiliary port linked to the host port of the first "slave" scanner in the chain. Thereafter, each slave's auxiliary port is linked to the host port of the slave that is further from the host in the daisy chain.

Each scanner in the daisy chain can be assigned an ID that accompanies any data that it sends.

Usage: Useful in applications where:

- A bar code label might be scanned in both ladder and picket fence directions.
- A bar code label may be present on multiple sides of a package.
- Bar code labels are presented at different depths.

Serial Cmd: *<**Ky*** ***aux port mode**,baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID>*

Options: **4 = Daisy chain**

Function: Before the master scanner times out, it checks its auxiliary port for data. It should be set to wait at least **20**mS for each slave in the daisy chain. If no data is received within the read cycle timeout, the master sends a noread message to the host. Otherwise the complete data is sent.

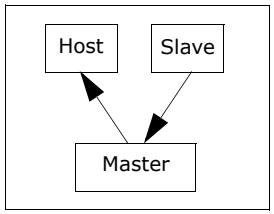
If for example the master scanner is set to timeout in 120 mS, the first slave scanner downstream might be set to 100 mS, the next to 80 mS, and so forth, thus assuring that at least 20 mS elapses between transmissions.[a]

Daisy-chained scanners can send a series of labels by enabling **Multilabel** and a common multilabel separator. If the master scanner does not receive the expected number of labels, noread messages are appended to the data string to make up the difference between the number of labels enabled in **Multilabel** and the number of labels read.

For example, a master and two slave scanners have **Number of Labels** set to 3 and **Multilabel Separator** defined as %. If the master and the first slave scanner do not find labels, but the next slave scanner registers a good read, the transmitted results would be: label data % noread % noread.

a. The above example is based on the best case. Other factors such as baud rate, number of characters in a given symbol, and the number of slaves in the daisy chain can affect timing and may need to be included in your calculations for complete accuracy.

Conditions: The conditions for a daisy chain application are as follows:



1. The master scanner's trigger must be **Serial** or **External**; the slave scanners' triggers are configured for **Serial**.
2. All scanners are enabled to **Daisy Chain** mode.
3. Each scanner's auxiliary port must be connected to the Host port of its slave scanner.
4. Each slave scanner in the daisy chain must be set to send its data no less than **20** mS before its preceding scanner.
5. All but the master scanner must have **Postamble** enabled and set to **CR** (^M) only.
6. All but the master scanner must have their noread messages disabled.
7. If **Multilabel** is enabled, **Multilabel Separator** characters must match in all scanners and **Number of Labels** must be set to number large enough to include all the labels it may itself read plus the number of labels that it will be expected to relay to the host or the next scanner up the line.
8. **Symbology ID** enable/disable must be the same in all scanners.
9. All but the master scanner must have their diagnostic warning messages disabled.
10. **Daisy Chain ID Status** enable/disable and the number of characters in **Daisy Chain ID** must be the same in all scanners.

Aux Port Communications Parameters

As with the host port parameters, the auxiliary terminal's settings (baud rate, parity, stop bits, and data bits) must be identical with those of the auxiliary device.

Baud Rate, Aux Port

Definition: The rate at which the scanner and host transfer data back and forth.

Usage: Can be used to transfer data faster or match an auxiliary device.

Serial Cmd: *<**Ky**aux port mode,**baud rate**,parity,stop bits,data bits,daisy chain ID status,daisy chain ID>*

Default: **9600**

Options:

0 = 600	3 = 4800	6 = 38.4K
1 = 1200	4 = 9600	7 = 57.6K
2 = 2400	5 = 19.2K	8 = 300

Parity, Aux Port

Definition: An error detection routine in which one data bit in each character is set to 1 or 0 so that the total number of 1 bits in the data field is even or odd.

Usage: Only changed if necessary to match host setting.

Default: **Even**

Options: *<**Ky**aux port mode,baud rate,**parity**,stop bits,data bits,daisy chain ID status,daisy chain ID>*

Serial Cmd:

0 = None	1 = Even	2 = Odd

Stop Bits, Aux Port

Definition: Allows the user to select the last one or two bits in each character to indicate the end of the character.

Usage: Only changed if necessary to match host setting.

Serial Cmd: *<**Ky**aux port mode,baud rate,parity,**stop bits**,data bits,daisy chain ID status,daisy chain ID>*

Default: **One**

Options:

0 = One	1 = Two

Data Bits, Aux Port

Definition: Number of bits in each character.

Usage: Only changed if necessary to match host setting.

Serial Cmd: <**Ky***aux port mode,baud rate,parity,stop bits,**data bits**,daisy chain ID status,daisy chain ID>*

Default: **Seven**

Options: 0 = Seven 1 = Eight

Daisy Chain ID Status

Definition: Each scanner in a daisy chain can be assigned a one or two character ID that will appear in front of decoded data and identify its source.

Usage: Used in a daisy chain setup in cases where the host needs to know which scanner in a daisy chain setup sent the data.

Serial Cmd: <**Ky***aux port mode,baud rate,parity,stop bits,data bits,**daisy chain ID status**,daisy chain ID>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Note: Enable/disable and length must be the same in all scanners.

Daisy Chain ID

Definition: A one or two character prefix which identifies the particular daisy chain scanner from which the data is being sent.

Usage: Used in a daisy chain setup in cases where the host needs to know which scanner sent the data.

Serial Cmd: <**Ky***aux port mode,baud rate,parity,stop bits,data bits,daisy chain ID status,**daisy chain ID**>*

Default: **1/**

Options: Any one or two ASCII characters.

Chapter

3

Protocol

Chapter Contents

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LRC....3-9
Response Timeout....3-10
Intercharacter Delay....3-11
Output Data Format....3-12

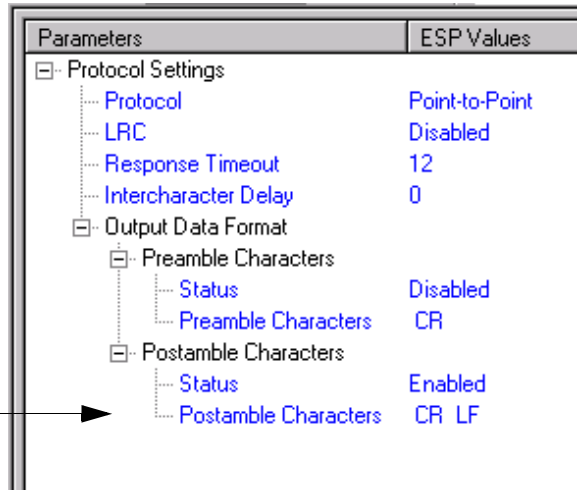
Protocols are the rules by which devices pass data back and forth. This section includes the basic options available for data communication, including multidrop and user-defined options and output data formats.

Note: The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Protocol by ESP

Click this button to bring up the **Protocol** menu

To change a setting, **double-click** the setting and use your curser to scroll through the options.



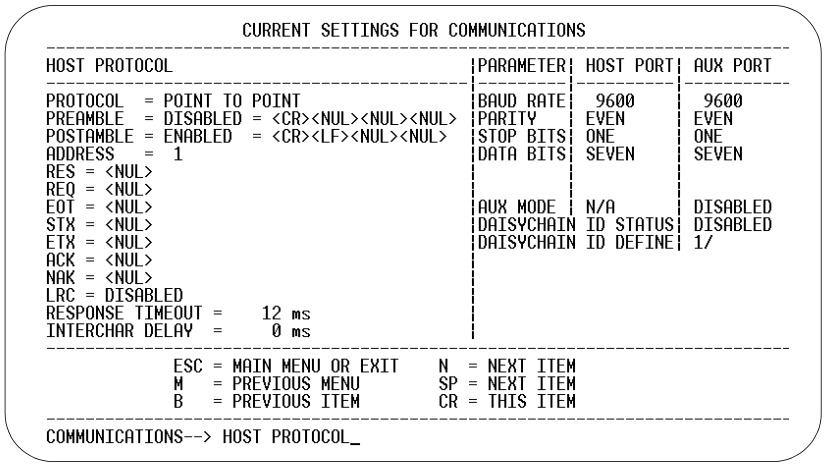
Protocol by Serial Command

Command Title	cmds	Format
Host Protocol	**Kf**	<**Kf***protocol*>
LRC	**Kc**	<**Kc***status*>
Response Timeout	**KA**	<**KA***response timeout*>
Intercharacter Delay	**KB**	<**KB***intercharacter delay*>
Preamble	**Kd**	<**Kd***status,preamble*>
Postamble	**Ke**	<**Ke***status,postamble*>
Comm. Status Request	**KT?**	<**KT?**>

Protocol by Embedded Menu

For information on accessing the embedded menus, see "Embedded Menus" on page A-20.

From the Main menu, scroll down through the options and select the following screen:



Protocol

Definition:	Protocols define the sequence and format in which information is transferred between the scanner and the host, or in the case of **Multidrop**, between scanners and a concentrator.
Usage:	In general, the point-to-point protocols will work well in most applications. They require no address and must use RS232 or RS422 communications standards.
Default:	**Point-to-Point**
Options:	0 = Point-to-Point 1 = Point-to-Point with RTS/CTS 2 = Point-to-Point with XON/XOFF 3 = Point-to-Point with RTS/CTS & XON/XOFF 4 = Polling Mode D 5 = Multidrop 6 = User Defined 7 = User Defined Multidrop If selecting one of the options from 0 to 4 (**Point-to-Point**, **Point-to-Point with RTS/CTS**, **Point-to-Point with XON/XOFF**, **Point-to-Point with RTS/CTS and XON/XOFF**, or **Polling Mode D**), use the <**Kf***protocol*> format. Option 5 through 7 are special cases and discussed later in this section.

Point-to-Point (standard)

Definition:	Standard **Point-to-Point** requires no address and sends data to the host whenever it is available, without any request or handshake from the host.
Usage:	Used only with RS232 or RS422.
Serial Cmd:	<**Kf*0***>

Point-to-Point with RTS/CTS

Definition:	**Point-to-Point with RTS/CTS** (request-to-send/clear-to-send) is a simple hardware handshaking protocol that allows a scanner to initiate data transfers to the host.
Usage:	A scanner initiates a data transfer with an RTS (request-to-send) transmission. The host, when ready, responds with a CTS (clear-to-send) and the data is transmitted. CTS and RTS signals are transmitted over two dedicated wires as defined in the RS-232 standard. Used only with RS232.
Serial Cmd:	<**Kf*1***>

Point-to-Point with XON/XOFF (Transmitter On/Off)

Definition:	This option enables the host to send the XON and XOFF command as a single byte transmission command of start (^Q) or stop (^S).
Usage:	If an XOFF has been received from the host, data will not be sent to the host until the host sends an XON. During the XOFF phase, the host is free to carry on other chores and accept data from other devices. Used only with RS232.
Serial Cmd:	<**Kf2**>

Point-to-Point with RTS/CTS & XON/XOFF

Definition:	This option is a combination of **Point-to-Point with RTS/CTS** and **Point-to-Point with XON/XOFF.**
Usage:	Used only with RS232.
Serial Cmd:	<**Kf*3***>

Polling Mode D

Definition:	Like **Point-to-Point**, **Polling Mode D** requires a dedicated connection to the host; but unlike **Point-to-Point**, it requires an address and must wait for a poll from the host before sending data.
Usage:	When in **Polling Mode D,** an address of 1 is automatically displayed on the configuration screen. However, during transmission, a 1C hex poll address (FS) and a 1D hex select address (GS) are substituted for the 1.
Serial Cmd:	<**Kf*4***>

Multidrop

Note: See also "Multidrop Communications" on page A-34.

Definition:	**Multidrop** allows up to 50 devices to be connected to a single RS485 host, with the scanner assigned an unique address (from 01 to 50).
Usage:	The MS-5000 can be used as a concentrator to a single host port connection. When **Multidrop** is selected, the protocol characters for RES, REQ, etc. are assigned automatically.
Multidrop Addresses:	Each address has its own separate poll and select address (from 1C to 7F hex).
Options:	01 through 50
Serial Cmd:	If selecting **Multidrop** fan address must be defined and appended to the command string. Format: <**Kf5**,*address[01 to 50]*>

Note: Scanners linking up to a Microscan MS-5000 multidrop concentrator must be configured in standard multidrop protocol.

User Defined Point-to-Point

Definition:	**User Defined Point-to-Point** allows the user to customize the point-to-point protocol.
Usage:	Useful for developing custom protocols in polled or unpolled mode.
Serial Cmd:	*<**Kf6**,RES,address,REQ,EOT,STX,ETX,ACK,NAK,from host>*

User Defined Address

Definition:	**User Defined** is considered to be in a polled mode only if an address has been assigned.
Serial Cmd:	*<**Kf6**,RES,**address**,REQ,EOT,STX,ETX,ACK,NAK,from host>*
Default:	No address
Options:	*Any ASCII character except a null.*

User Defined Example

Definition: Example: ACK/NAK protocol can be configured using **User Defined**. The scanner will transmit data to the host, when an **ACK** is received, it will carry on with its business. If a **NAK** or response timeout occurs, the scanner will re-send the data to the host up to 3 more times before aborting.

Tip: To use **User Defined Point-to-Point**, first select **Point-to-Point <Kf*0*>** and then **User Defined <Kf*6*>**.

Example: To select an unpolled ACK/NAK **User Defined** protocol with LRC disabled, send **<Kf*0*><Kf*6*,,,,,,,^F,^U><Kc*0*>**. ACK and NAK will be displayed in the menu.

Serial Cmd: <**Kf*6***,*RES,address,****REQ,EOT,STX,ETX,ACK,NAK***,*from host*>

Default: **No assignment**

Options: Any ASCII character except a null. Control characters can be used to define RES through NAK in serial commands.

From Host

Definition: This option allows the handshaking protocol to be initiated from the host, if not configured in an unpolled mode. Messages sent to the host will include the scanner's defined protocol. The status of **From Host** determines if messages sent from the host to the scanner must include the defined protocol. If **From Host** is disabled, the defined protocol is not included. If **From Host** is enabled, the defined protocol must be included.

Serial Cmd: <**Kf*6***,*RES,address,REQ,EOT,STX,ETX,ACK,NAK,****from host***>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

User Defined Multidrop

Definition: **User Defined Multidrop** allows the user to customize the polling protocol.

Usage: This option is used when connecting to a concentrator or other device that does not match standard multidrop protocol.

If selecting **User Defined Multidrop** (7), complete the format by either choosing new parameters or place commas where unchanged data fields occur.

Serial Cmd: *<**Kf7**,RES,address,REQ,EOT,STX,ETX,ACK,NAK>*

For **User Defined Multidrop**, first select **Multidrop <KF*5*>**, then **User Defined Multidrop <KF*7*...>**.

Address: Any single character (02 hex to 7E hex) in the ASCII table can be assigned as the address character. The character chosen is used as the poll character and the subsequent ASCII character becomes the select character. For example, if a **^B** (02 hex) is selected as the address, **^C** (03 hex) becomes the select address that the host will use in sending host select commands.

Note: Any ASCII character except a null (00) and a ^A (01) can be assigned as an address. Control characters can be used to define RES through NAK in serial commands. (See "Communication Protocol Commands" on page A-19.)

Note: Definitions of commands in **User Defined** and **User Defined Multidrop** must be duplicated in host applications to enable poll and select sequences to execute correctly during transmission.

Note: Typically, parameters in **User Defined Multidrop** are defined by first enabling **Multidrop**, then enabling **User Defined Multidrop**. This pre-loads multidrop characters into the parameters. Then changes are made to individual characters to match the host or other requirements.

LRC

(Longitudinal Redundancy Check)

Definition:	An error-checking routine that verifies the accuracy of transmissions. It is the exclusive OR of all characters following the **STX** (start of text) up to and including the **ETX** (end of text). What this means is that the binary representation of all the characters in a transmissions are cumulatively added in a column and each resulting odd integer is assigned a 1 and each even integer a 0 (two 1s = 0, two 0s = 0, a 1 and a 0 = 1). The extra **LRC** character is then appended to the transmission and the receiver (usually the host) performs the same addition and compares the results.
Usage:	Used when extra data integrity is required.
Serial Cmd:	<**Kc***status*>
Default:	**Disabled**
Options:	0 = Disabled 1 = Enabled

Response Timeout

Definition:	Time the scanner will wait before timing out if **ACK**, **NAK**, and **ETX** are enabled, and a host response is expected.
Usage:	Only used when a response is required from the host. While in **Multi-drop**, if the scanner does not receive an **ACK** or **NAK** from the host after sending polled data, it will act on a fault. The scanner can be set to wait indefinitely by setting **Response Timeout** to zero.
Serial Cmd:	<**KA***response timeout*>
Default:	**12**mS (in 1mS increments)
Options:	0 to 65000 (0 to 65 seconds) (A zero (0) setting causes an indefinite wait.)

Intercharacter Delay

Definition:	The time interval in milliseconds between individual characters transmitted from the scanner to the host.
Usage:	**Intercharacter Delay** is only used where a host cannot receive data quickly enough and there is enough time between labels to allow data to be completely transferred. It is rarely used since any setting other than zero will slow down communications. For example, a 200 setting will result in a 1/5 second delay between each character that is transmitted.
Serial Cmd:	<**KB***intercharacter delay*> Example: To change **Intercharacter Delay** to 30 mS, send **<KB*30*>**.
Default:	**0**
Options:	0 to 255 (in milliseconds). Zero (0) causes no delay between characters.

Output Data Format

Up to four user defined ASCII characters, including control characters can be defined and added to the front or end of the data string that is sent from the scanner to the host.

Preamble Characters

Preamble Status

Definition: Defines a one to four character data string that can be added to the front of the decoded data.

Usage: Useful for identifying and controlling incoming data. For example, defining the **preamble** as a carriage return and a line feed causes each decoded message to be displayed of on its own line.

Serial Cmd: <**Kd*status***,*preamble character(s)*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled (within any protocol)

Preamble Character(s)

Serial Cmd: <**Kd***status*,***preamble character(s)***>

Default: **^M** corresponds to: **carriage return/null/null/null**.

Options: Up to four user-defined ASCII character, including control characters.

Within a Serial Command

To enter control characters within a serial command, hold down the control key while typing the desired character.

Example: **<Kd1,CNTL-m>** to enter **^M**

Within an Embedded Menu

Control characters entered on the command line are displayed in the menu as mnemonic characters, such as: <CR><NUL><NUL><NUL>.

To enter a control character from within an embedded menu, first type in a space (with the space key). This has the effect of allowing the control key to be recognized as a part of the control character. Next hold down the control key while typing the desired character.

Example: **Space CNTL-m** to enter **^M.**

Postamble Characters

Postamble Status

Definition: Defines a one to four character data string that can be added to the end of the decoded data.

Usage: Useful for identifying and controlling incoming data. For example, defining the postamble as a carriage return and a line feed causes each decoded message to be displayed of on its own line.

Serial Cmd: <**Ke*status***,*postamble character(s)*>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled (within any protocol)

Postamble Character(s)

Serial Cmd: <**Ke***status*,***postamble character(s)***>

Default: **^M^J**. Corresponds to carriage return/line feed/null/null, as displayed in the menu.

Options: Up to four user-defined ASCII character, including control characters.

Within a Serial Command

To enter control characters within a serial command, hold down the control key while typing the desired character.

Example: **<Ke1,CNTL-m CNTL-j>** to enter ^M^J.

Within an Embedded Menu

Control characters entered on the command line are displayed in the menu as mnemonic characters, such as: <CR><LF><NUL><NUL>

To enter a control character from within an embedded menu, first type in a space (with the space key). This has the effect of allowing the control key to be recognized as a part of the control character. Next hold down the control key while typing the desired character.

Example: **Space CNTL-m Space CNTL-j** to enter ^M^J.

Chapter

4

Read Cycle/Trigger

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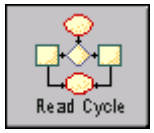
Read cycles and triggering modes are at the heart of bar code scanning. After you've established communications and completed basic read rate testing, you will need to address the spatial and timing parameters associated with your application. In a typical operation a bar-coded item moves along a line past a scanner. A sensor or timer activates a read cycle during which the scanner actively searches for bar code symbols. You will need to decide how to initiate the read cycle and how and when to end it. This section addresses these issues.

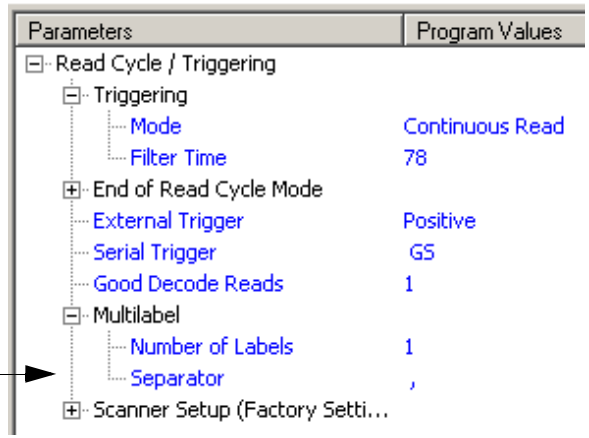
Note: The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Read Cycle/Triggering by ESP



Click this Button to bring up the **Read Cycle/ Triggering** menu

To change a setting, **double-click** the setting and use your curser to scroll through the options.



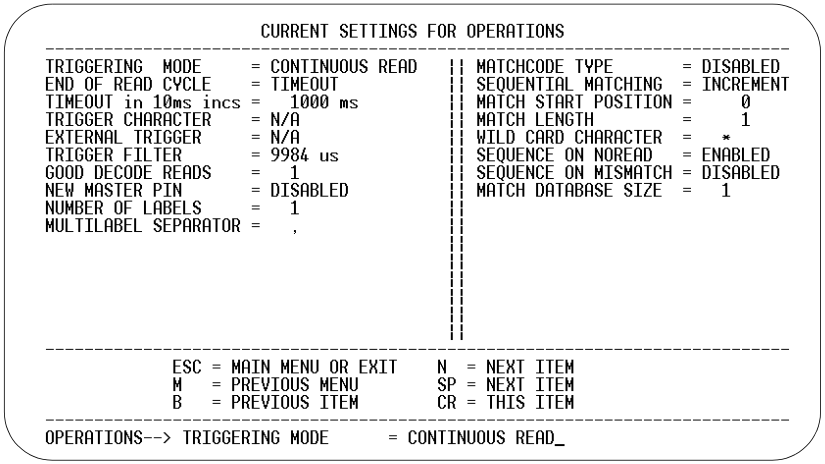
Read Cycle/Triggering by Serial Command

Command Title	Cmd	Format
Trigger Mode	**Kg**	<**Kg***trigger mode,filter time*>
Serial Trigger Character	**Ki**	<**Ki***serial trigger character*>
Good Decode Reads	**Km**	<**Km***decodes before output*>
External Trigger State	**Kj**	<**Kj***external trigger state*>
End of Read Cycle	**Kh**	<**Kh***end of read cycle,timeout duration*>
Multilabel	**KL**	<**KL***number of labels,multilabel separator*>
Read Cycle Status Request	**KV**	<**KV?**>

Read Cycle/Trigger by Embedded Menu

For information on accessing the embedded menus, see "Embedded Menus" on page A-20.

From the Main menu, scroll down through the options and select the following screen:


CURRENT SETTINGS FOR OPERATIONS
TRIGGERING MODE = CONTINUOUS READ
END OF READ CYCLE = TIMEOUT
TIMEOUT in 10ms incs = 1000 ms
TRIGGER CHARACTER = N/A
EXTERNAL TRIGGER = N/A
TRIGGER FILTER = 9984 us
GOOD DECODE READS = 1
NEW MASTER PIN = DISABLED
NUMBER OF LABELS = 1
MULTILABEL SEPARATOR = ,
MATCHCODE TYPE = DISABLED
SEQUENTIAL MATCHING = INCREMENT
MATCH START POSITION = 0
MATCH LENGTH = 1
WILD CARD CHARACTER = *
SEQUENCE ON NOREAD = ENABLED
SEQUENCE ON MISMATCH = DISABLED
MATCH DATABASE SIZE = 1
ESC = MAIN MENU OR EXIT
M = PREVIOUS MENU
B = PREVIOUS ITEM
N = NEXT ITEM
SP = NEXT ITEM
CR = THIS ITEM
OPERATIONS--> TRIGGERING MODE = CONTINUOUS READ_

Trigger Mode

Note: This command does not need to be followed by an <A> command.

Definition: The type of trigger event that will initiate the read cycle.

Serial Cmd: <**Kg*trigger mode,****trigger filter duration***>

Default: **Continuous Read**

Options:

0 = Continuous Read
1 = Continuous Read 1 Output
2 = External Level
3 = External Edge
4 = Serial Data
5 = Serial Data & External Edge

Continuous Read

Definition: In **Continuous Read**, trigger input options are disabled, the scanner is always in the read cycle, and it will attempt to decode and transmit every scan crossing a label.

When To Output and **Noread** options have no affect on **Continuous Read**.

Usage: **Continuous Read** is useful in testing bar code label readability or scanner functions. It is not recommended for normal operations.

Serial Cmd: <**Kg*0***>

Continuous Read 1 Output

Definition: In **Continuous Read 1 Output** the scanner self-triggers whenever it decodes a new bar code label or a timeout occurs.

If **End Of Read Cycle** is set to **Timeout** and the label doesn't change, the scanner will repeat the output at the end of each timeout period. For example, if **Timeout** is set to one second, the scanner sends the label data immediately and repeats the output at intervals of one second for as long as the label continues to be scanned.

If **End Of Read Cycle** is set to **New Trigger**, the scanner will send the current label data immediately, but send it only once. A new label appearing in the scanner's range will be read and sent immediately provided it is not identical to the previous label read.

Usage: **Continuous Read 1 Output** can be useful in applications where it is not feasible to use a trigger and all succeeding labels contain different information. It is also effective in applications where the objects are hand presented.

Serial Cmd: <**Kg*1***>

Caution: In automated environments, **Continuous Read 1 Output** is not recommended because there is no one to verify that a label was missed.

Note: If **Trigger** is set to **Continuous Read 1 Output**, **Number of Labels** will default back to **1** (if set to any number greater than 1).

External Trigger Level

Definition: **External Trigger Level** allows the read cycle (active state) to begin when a trigger (change of state) from an external sensing device is received. The read cycle endures until the object moves out of the sensor range and the active trigger state changes again.

Usage: This mode is effective in an application where the speeds of the conveying apparatus are variable and the time the scanner spends scanning each object is not predictable. It also allows the user to determine if a noread has occurred.

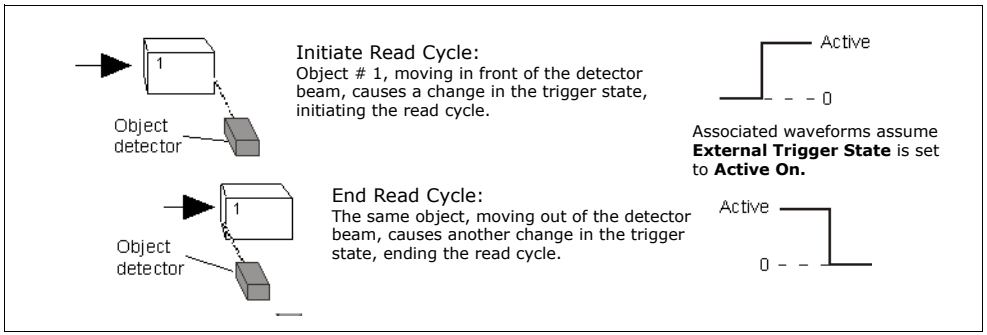

1
Object detector
Initiate Read Cycle:
Object # 1, moving in front of the detector beam, causes a change in the trigger state, initiating the read cycle.
Active
0
Associated waveforms assume **External Trigger State** is set to **Active On.**
1
Object detector
End Read Cycle:
The same object, moving out of the detector beam, causes another change in the trigger state, ending the read cycle.
Active
0

Figure 4-1 Trigger Level

Serial Cmd: <**Kg2**>

Important: Level and **Edge** apply to the active logic state (Active Off (I_{OFF})or Active On (I_{ON})) that exists while the object is in a read cycle, between the rising edge and falling edge. *Rising edge* is the trigger signal associated with the appearance of an object. *Falling edge* is the trigger signal associated with the subsequent disappearance of the object.

External Trigger Edge

Definition: **External Trigger Edge**, as with Level, allows the read cycle (active state) to begin when a trigger (change of state) from an external sensing device is received. However, the passing of an object out of sensor range does not end the read cycle. The read cycle ends with a good read output or, depending on **End of Read Cycle** setting, a timeout or new trigger occurs.

Usage: This mode is highly recommended in any application where conveying speed is constant or if spacing, object size, or timeouts are consistent.

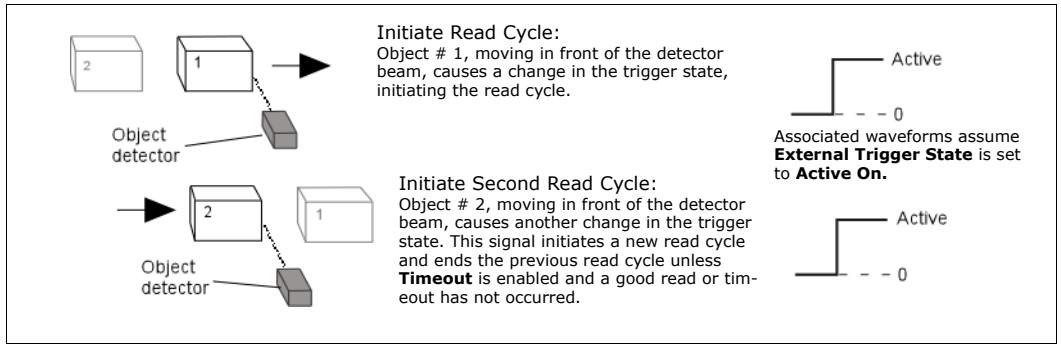

2
1
Object detector
Initiate Read Cycle:
Object # 1, moving in front of the detector beam, causes a change in the trigger state, initiating the read cycle.
Active
0
Associated waveforms assume **External Trigger State** is set to **Active On.**
2
1
Object detector
Initiate Second Read Cycle:
Object # 2, moving in front of the detector beam, causes another change in the trigger state. This signal initiates a new read cycle and ends the previous read cycle unless **Timeout** is enabled and a good read or timeout has not occurred.
Active
0

Figure 4-2 Trigger Edge

Serial Cmd: <**Kg3**>

Important: Level and **Edge** apply to the active logic state (**Active Off** (I_{OFF}) or **Active On** (I_{ON})) that exists while the object is in a read cycle, between the rising edge and falling edge. *Rising edge* is the trigger signal associated with the appearance of an object. *Falling edge* is the trigger signal associated with the subsequent disappearance of the object.

Serial Data

Definition: In **Serial Data**, the scanner accepts an ASCII character from the host or controlling device as a trigger to start a read cycle. A **Serial Data** trigger behaves the same as an **External Edge** trigger.

Serial commands are entered inside corner brackets, such as **<t>**.

Usage: **Serial Data** is effective in a highly controlled environment where the host knows precisely when the object is in the scan zone. It is also useful in determining if a noread has occurred.

Serial Cmd: <**Kg*4***>

Serial Data or External Edge

Definition: In this mode the scanner accepts either a serial ASCII character or an external trigger pulse to start the read cycle.

Usage: **Serial Data or External Edge** is seldom used but can be useful in an application that primarily uses an external sensing device but occasionally needs to be manually triggered.

An auxiliary terminal can be connected to the aux port so the user can send the serial trigger character through the scanner to the host.

Serial Cmd: <**Kg*5***>

Triggering

Serial Trigger Character

Definition:	**Serial Trigger Character** is the definable ASCII character that a host sends to the scanner to begin a read cycle.
Usage:	**Serial Trigger Character** is useful in any application in which a read cycle needs to be initiated by a serial character from a host.
Serial Cmd:	<**Ki***serial trigger character*>
Default:	**^]**
Options:	Any available ASCII character (seeTable A-12, "ASCII Table with Control Characters," on page A-18).

Trigger Filter Duration

Definition:	**Trigger Filter Duration** can prevent trigger bounce from falsely triggering the scanner by limiting the time in which trigger pulses can be received.
Usage:	**Trigger Filter Duration** is useful where trigger bounce could cause false triggers.
Serial Cmd:	<**Kg** *trigger mode*,***trigger filter duration***>
Default:	**78** (x 128µS = 9984µS)
Options:	**2 to 255** (corresponding to 256µS to .03s in 128µS steps)

External Trigger State

Definition:	When enabled for **Active On (I_{ON})** the triggering device imposes a current on the optoisolator to activate the read cycle. When enabled for **Active Off (I_{OFF})** the triggering device interrupts the current to the optoisolator to activate the read cycle.
Usage:	Users can select the trigger state that will operate with their systems. (If using the Microscan object detector, use **Active Off**.)
Serial Cmd:	<**Kj*external trigger state***>
Default:	**Active On**
Options:	0 = Active Off 1 = Active On

Note: External Level, **External Edge**, or **Serial Data or Edge** trigger mode must be enabled for **External Trigger** to take effect.

Good Decode Reads

Definition:	The number of decodes (from 1 to 31) required per label before a label's decoded data is sent. It requires the scanner to successfully decode a label a designated number of times (not necessarily consecutively) before it is sent. If it doesn't achieve the number of good reads during the read cycle, then a noread will be sent. **Note**: Higher settings will decrease throughput speed.
Usage:	This is a very useful feature to increase reliability of reads for symbologies that do not have internal error checking such as Pharmacode.
Serial Cmd:	<**Km** ***decodes before output***>
Default:	**1**
Options:	1 to 31

Note: When setting up, be sure to determine if the scanner's scan rate is capable of scanning your longest label the required number of times.

End of Read Cycle

Note: **When to Output** must be set to **End of Read Cycle** before this command can be active. (See "Beeper Status" on page 8-13.)

Definition: The read cycle is the time during which the scanner will attempt to read and decode a bar code symbol. At the end of a read cycle the scanner stops reading labels and sends the label data or noread message to the host.

End of Read Cycle Mode

Definition: A read cycle can be terminated by a new trigger, a timeout, or a combination of both.

ESP: Double-click on **End of Read Cycle Mode** and make a selection.

Serial Cmd: <**Kh** ***end of read cycle***,*timeout duration*>

Default: **Timeout**

Options:
0 = Timeout
1 = New Trigger
2 = Timeout & New Trigger

Note: When operating in **Continuous Read** or **Continuous Read 1 Output**, the scanner is always in the read cycle.

Timeout

Definition: **Timeout** ends the read cycle when the time set in **Timeout** elapses or "times out."

If in **Continuous Read 1 Output**, a timeout initiates a new read cycle and allows the same label to be read again.

With either **External Edge**, **Serial Data**, or **Serial Data & Edge** enabled, a timeout ends the read cycle and label data or a noread message is sent to the host.

With **External Level** enabled, the read cycle does not end until the falling edge trigger or a timeout occurs. The next read cycle does not begin until the next rising edge trigger.

Usage: Typically used with Serial or **Edge** and **Continuous One**.

It is effective in highly controlled applications when the maximum length of time between objects can be predicted. It assures that a read cycle ends before the next bar-coded object appears, giving the system extra time to decode and transmit the data to the host.

New Trigger

Definition: **New Trigger** ends the current read cycle and initiates a new one when a new trigger occurs. **New Trigger** refers only to a "rising edge" trigger.

With either **External Edge**, Serial, or **Serial** or **Edge** enabled, an edge or serial trigger ends a read cycle and initiates the next read cycle.

In the case of **External Level**, a falling edge trigger ends the read cycle but the next read cycle does not begin until the occurrence of the next rising edge trigger.

(See figure 4-1 on page 4-6 and figure 4-2 on page 4-7.)

Usage: **New Trigger** is an effective way to end a read cycle when objects move past the scanner at irregular intervals (not timing dependent).

Note: When **New Trigger** is enabled, **Laser On/Off** will have no effect. When noreads occur, the laser will remain on.

Timeout or New Trigger

Definition: **Timeout or New Trigger** is identical to **Timeout**, except that a timeout *or* a new trigger (whichever occurs first) ends the read cycle.

Usage: Useful in applications that require an alternative way to end the read cycle. For example, if an assembly line should stop completely or the intervals between objects are highly irregular.

Timeout Duration

Definition: **Timeout Duration** is the time span of the read cycle and is represented in 10 mS increments. It is used in conjunction with **External Edge** or **Serial Trigger.**

Usage: It is useful in many tightly controlled applications which require a read cycle to end before the next object appears and therefore need the flexibility of a timeout adjustment.

Serial Cmd: <**Kh***end of read cycle,****timeout duration***>

Default: **100** (Corresponds to one second or 1000 mS.)

Options: 0 to 65535. (Divide any positive number entered by 100 to determine the time in seconds.)

Note: A minimum setting of **2** is recommended.

Note: **Timeout** or **Timeout or New Trigger** under **End of Read Cycle** must be enabled for **Timeout Duration** to take effect.

Multilabel

Definition: **Multilabel** allows the user to define up to 12 bar code labels that can be read in a single read cycle.

Usage: **Multilabel** is commonly used in shipping applications where a shipping label contains individual bar codes for part number, quantity, etc. This feature allows one trigger to pick up all the labels. AIAG and UCC/EAN-128 are two application standards that address this need.

Conditions Allows you to choose the number of different labels that can be read in a single trigger event. The following conditions apply:

1. All noread messages are posted at the end of the data string.
2. If more than one label is within the scan beam at the same time, label data may not be displayed in the order of appearance.
3. If **Matchcode Type** is set to **Sequential** or if **Trigger** is set to **Continuous Read 1 Output**, **Number of Labels** will default to **1** (if set to any number greater than 1).
4. The maximum number of characters in any one bar code (other than PDF417) is **64**. For PDF417 it's **2710**.
5. The maximum number of characters in a single scan line is **102** (Code 39).
6. The maximum number of characters for all labels is **788**, including preamble, separators, and LRC.

Table 4-1 Maximum Number of Characters per Numbers of Labels

Number of labels	Non-PDF Labels Cumulative Maximum	PDF Labels	
		Maximum per label	Cumulative Maximum
1-5	333	2710	13563
6	398	2320	13961
7	463	2030	14225
8	528	1804	14448
9	593	1622	14615
10	658	1474	14758
11	723	1350	14869
12	788	1246	14972

Number of Labels

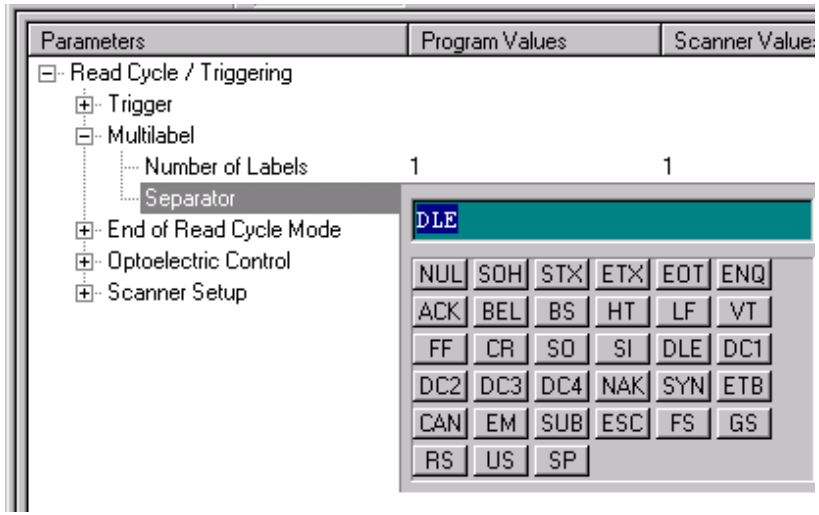
Definition:	**Number of Labels** is the number of different labels that can be read in a single read cycle.
Serial Cmd:	<**KL*number of labels***,*multilabel separator*>
Default:	**1**
Options:	1 to 12

Multilabel Separator

Definition: The character that's inserted between each label scanned when **Multi-label** is set to any number greater than **1**.

Usage: Used to delimit or separate data fields with a user defined character.

ESP: To select a new multilabel separator, double-click on **Separator** and select a character in the popup window.



Serial Cmd: <**KL** *number of labels*,***multilabel separator***>

Note: If **Multilabel Separator** has been changed to any character other than the default comma and you wish to re-define the separator as a comma, use ESP (as shown below) or the embedded menu.

Default: **,** (comma)

Options: Any available ASCII character, except **< > NUL**.

Chapter 5 Codes

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This section describes the various bar code symbol types that can be read and decoded by the scanner.

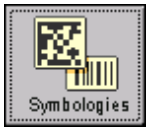
Code 39 is enabled by default. To enable all codes, right-click **Autodiscrimination** under Code Type in the Utilities menu and select **Enable**, or send a **<P>** serial command to the scanner from the Terminal window.[1]

Note: The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

See ***www.aimusa.org/standards*** for additional information about codes.

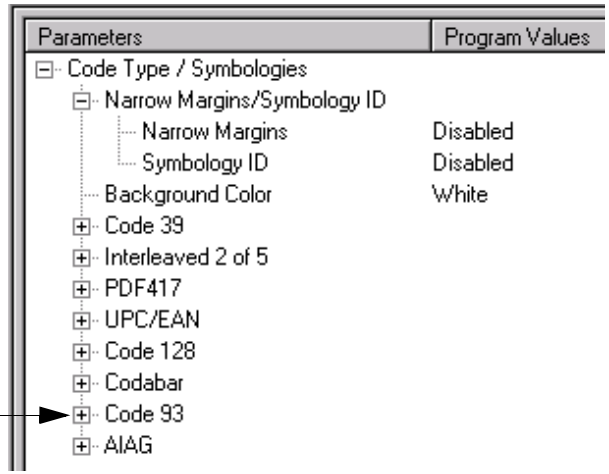
1. If using an I 2/5 label, verify that the number of characters in the label being scanned matches the code length enabled for the I 2/5 code type (default is 10 and 6).

Code Types by ESP



Click this button to bring up the **Code Types** menu.

To change a setting, **double-click** the setting and use your curser to scroll through the options.



Code Types by Serial Command

Command Title	cmds	Format
Narrow Margins/Symbology ID	**Ko**	<**Ko***narrow margins status,symbology identifier*>
Background Color	**Kx**	<**Kx***background color*>
Code 39	**Kp**	<**Kp***status,check digit status,check digit output status,large intercharacter gap,fixed code length status,fixed code length*>
Codabar	**Kq**	<**Kq***status,start & stop match status,start & stop output status,large intercharacter gap,fixed code length status,fixed code length,check digit type,check digit output*>
Interleaved 2 of 5	**Kr**	<**Kr***status,check digit,check digit output,length 1,length 2*>
UPC/EAN	**Ks**	<**Ks***UPCstatus,EAN status,supplementals status,separator status,separator character*>
PDF417	**K[**	<**K[***status,[usused],fixed code length status,fixed code length*>
Code 128	**Kt**	<**Kt***status,fixed length status,fixed code length*>
UCC/EAN-128 (subset of Code 128)	**Kt**	<**Kt**,,,*UCC/EAN-128 status,output format,application record separator status,application record separator character,application record brackets,application record padding*
Code 93	**K!**	<**K!***status,fixed code length status,fixed code length*>
AIAG	**KZ**	<**KZ***AIAG status, ID1, status1, ID2, status2, ID3, status3, ID4, status4, *ID5a,ID5b,ID5c, status5, ID6, status6, ID7, status7, ID8, status8, ID9, status9, ID9, status10, ID11, status11, ID12, status12*>
Code Type Status Request	**KW?**	<**KW?**>

Code Types by Embedded Menu

For information on accessing the embedded menus, see "Embedded Menus" on page A-20.

From the Main menu, scroll down through the options until you reach the following screen:

CURRENT SETTINGS FOR CODE TYPES

	CODE 39	CODABAR	I 2 OF 5	UPC	CODE 128
CODE TYPE	ENABLED	DISABLED	DISABLED	DISABLED	DISABLED
FIXED LENGTH	DISABLED	DISABLED	N/A	N/A	DISABLED
CODE LENGTH #1	10	10	10	N/A	10
CODE LENGTH #2	N/A	N/A	6	N/A	N/A
CHECK DIGIT	DISABLED	DISABLED	DISABLED	N/A	N/A
C/D OUTPUT	DISABLED	DISABLED	DISABLED	N/A	N/A
INTERCHAR GAP	DISABLED	DISABLED	N/A	N/A	N/A
S/S MATCH	N/A	ENABLED	N/A	N/A	N/A
S/S OUTPUT	N/A	ENABLED	N/A	N/A	N/A
EAN	N/A	N/A	N/A	DISABLED	N/A
SUPPLEMENTALS	N/A	N/A	N/A	DISABLED	N/A
NARROW MARGINS	DISABLED	DISABLED	DISABLED	DISABLED	DISABLED

CURRENT SETTINGS FOR CODE TYPES 1

	CODE 39	CODE 128	I 2 OF 5	CODE 93	
CODE TYPE	ENABLED	DISABLED	DISABLED	DISABLED	
FIXED LENGTH	DISABLED	DISABLED	N/A	DISABLED	
CODE LENGTH #1	10	10	10	10	
CODE LENGTH #2	N/A	N/A	6	N/A	
CHECK DIGIT	DISABLED	N/A	DISABLED	N/A	
C/D OUTPUT	DISABLED	N/A	DISABLED	N/A	
INTERCHAR GAP	DISABLED	N/A	N/A	N/A	
FULL ASCII	DISABLED	N/A	N/A	N/A	

CURRENT SETTINGS FOR CODE TYPES 2

	CODABAR	UPC			
CODE TYPE	DISABLED	DISABLED			
FIXED LENGTH	DISABLED	N/A			
CODE LENGTH #1	10	N/A			
CODE LENGTH #2	N/A	N/A			
CHECK DIGIT	DISABLED	N/A			
C/D OUTPUT	DISABLED	N/A			
INTERCHAR GAP	DISABLED	N/A			
S/S MATCH	ENABLED	N/A			
S/S OUTPUT	ENABLED	N/A			
SUPPLEMENTALS	N/A	DISABLED			
SUPPLEMENTAL TYPE	N/A	BOTH			
EAN	N/A	DISABLED			
SEPARATOR STATUS	N/A	DISABLED			
SEPARATOR DEFINE	N/A	,			

Narrow Margins

Definition: Allows the scanner to read symbols with quiet zones less than 8 times the width of the narrow bar element. "Quiet zone" is the space at the leading and trailing ends of a symbol. Each quiet zone can be as narrow as only five times the width of the narrow bar element when **Narrow Margins** is enabled.

Usage: Used when the leading and trailing edges of the symbols are smaller than the standard margin or other objects encroach into the margins.

Serial Cmd: <**Ko*narrow margins status***,*symbology identifier*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Note: Do not use **Narrow Margins** with **Large Intercharacter Gap** enabled in Code 39 or Codabar.

Symbology ID

Definition: Symbology ID is an AIM standard prefix character that identifies the bar code type.

When enabled, the scanner analyzes and identifies the bar code symbology and adds a three character identifying prefix to the data:

1. **]** (close bracket character) indicating the presence of a symbology ID
2. **A, C, E, F, G, I, L, Q**
   A = Code 39; C = Code 128 or UCC/EAN-128; E = UPC/EAN; F = Codabar; G = Code 93; I = I–2 of 5; L = PDF417; Q = Pharma Code
3. **Modifier**, a single number indicating the status of the check digit character:

If **Check Digit** is not enabled, the output is 0 (Col. 1). If **Check Digit** and **Check Digit Output** are enabled, the output is as shown in Column 2. If **Check Digit** is enabled, but **Check Digit Output** is disabled (Col. 3), the output is as shown in Col. 4, which is the sum of Col. 2 and Col. 3.

Usage: Used when host needs to know the symbology type and how it's decoded.

Serial Cmd: <**Ko***narrow margins status,**symbology identifier***>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Example: For **Code 39**, if **Check Digit** and **Check Digit Output** are both enabled, a 1 will be sent; if **Check Digit Output** is disabled, a 3 (sum of column 1 and column 2) will be sent.

Table 5-1 Symbology Identifier Option Values

Symbology I.D.	Symbology	Column 1 No check character	Column 2 Check digit Output enabled	Column 3 Check digit Output disabled	Column 4 Sum of Column 2 and 3	FNC 1 Character in first position
A	Code 39	0	1	2	3	
C	Code 128	0	0	0	0	
C	UCC/EAN-128	0	0	0	0	1
E	UPC/EAN	0	0	0	0	
F	Codabar	0	1	2	3	
G	Code 93	0	0	0	0	
I	I–2 of 5	0	1	2	3	
L	PDF417	0	0	0	0	
Q	Pharma Code	0	0	0	0	

Background Color

Definition: Allows the user to choose which symbol background (white or black) the scanner can read.

Usage: If the background is darker than the symbol, then enable black background.

Typically the background is white; but on PCBs for example, they can be black.

ESP:

Serial Cmd: <**Kx *background color***>

Default: **White**

Options: 0 = White
1 = Black

Code 39

Definition: An alphanumeric code with unique start/stop code patterns, composed of 9 black and white elements per character, of which 3 are wide.

Usage: **Code 39** is considered the standard for non-retail symbology.

Code 39 Status

Serial Cmd: <**Kp*status***,*check digit status,check digit output status,large intercharacter gap,fixed code length status,fixed code length,full ASCII set*>

Default: **Enabled**

Note: This is the only code type enabled by default.

Options: 0 = Disabled 1 = Enabled

Check Digit Status (Code 39)

Serial Cmd: <**Kp***status,**check digit status**,check digit output,large intercharacter gap,fixed code length status,fixed code length,full ASCII set*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Check Digit Output (Code 39)

Definition: When enabled, the check digit character is read and compared along with the label data. When disabled, label data is sent without the check digit.

Note: With **Check Digit Output** and an **External** or **Serial** trigger option enabled, an invalid check digit calculation will cause a noread message to be transmitted at the end of the read cycle.

Usage: **Check digit Output**, added to the bar code symbol, provides additional security.

Serial Cmd: <**Kp***status,check digit status,**check digit output**,large intercharacter gap,fixed code length status,fixed code length,full ASCII set*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Large Intercharacter Gap (Code 39)

Definition: When enabled, the scanner can read symbols with gaps between bar code characters that exceed three times (3x) the narrow element width.

Usage: **Large Intercharacter Gap** is helpful for reading symbols that are printed out of specification.

Caution: Do not use **Large Intercharacter Gap** with **Narrow Margins** enabled since a large intercharacter gap (over 3x) could cause a narrow margins (5x) to be interpreted as an intercharacter gap.

Serial Cmd: *<**Kp** status,check digit status,check digit output,**large intercharacter gap**,fixed code length status,fixed code length,full ASCII set>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Code Length Status (Code 39)

Definition: When enabled the scanner will check the label length against the code length field. If disabled any length would be considered a valid label.

Serial Cmd: *<**Kp** status,check digit status,check digit output,large intercharacter gap,**fixed code length status**,fixed code length,full ASCII set>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Code Length (Code 39)

Definition: Specifies the exact number of characters that the scanner will recognize (this does not include start and stop and check digit characters). The scanner ignores any code not having the specified length.

Usage: **Fixed Code Length** helps prevent truncations and increases data integrity by ensuring that only one label length will be accepted.

Serial Cmd: *<**Kp** status,check digit status,check digit output,large intercharacter gap,fixed code length status,**fixed code length**,full ASCII set>*

Default: **10**

Options: 1 to 64

Full ASCII Set (Code 39

Definition:	Standard Code 39 encodes 43 characters; zero through nine, capital "A" through capital "Z", minus symbol, plus symbol, forward slash, space, decimal point, dollar sign and percent symbol. When **Full ASCII Set** is enabled, the scanner can read the full ASCII character set, from 0 to 255.
Usage:	Must be enabled when reading characters outside the standard character set (0-9, A-Z, etc.) User must know in advance whether or not to use **Full ASCII Set** option. Since **Full ASCII Set** requires two code words to encode one character, it is less efficient.
Serial Cmd:	<**Kp***status,check digit status,check digit output,large intercharacter gap,fixed code length status,fixed code length,**full ASCII set***>
Default:	**Disabled**
Options:	0 = Disabled 1 = Enabled

Codabar

Definition: Codabar is a 16-character set (0 through 9, and the characters $, :, /, ., +, and –) with start/stop codes and at least two distinctly different bar widths.

Usage: Used in photo-finishing and library applications. Formerly used in some medical applications but not typically used in newer applications.

Codabar Status

Serial Cmd: <**Kq*status***,*start & stop match,start & stop match output,large inter-character gap,fixed code length status,fixed code length,check digit type,check digit output*>

Default: **Disabled**

Options: 0 = Disable 1 = Enabled

Start & Stop Match (Codabar)

Definition: Requires the Codabar start and stop characters (a, b, c, or d) to match before a valid read can occur.

Usage: Used to increase security of symbology.

Serial Cmd: <**Kq***status*,***start & stop match***,*start & stop match output,large inter-character gap,fixed code length status,fixed code length,check digit type,check digit output*>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

Start & Stop Output (Codabar)

Definition: Causes the start and stop characters to be transmitted with bar code data.

Usage: Used to verify matching.

Serial Cmd: <**Kq***status,start & stop match*,***start & stop match output***,*large inter-character gap,fixed code length status,fixed code length,check digit type,check digit output*>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

Large Intercharacter Gap (Codabar)

Definition: Instructs the scanner to read symbols with gaps between characters exceeding three times the narrow element width.

Usage: It is helpful for reading symbols that are printed out of specification.

Caution: Do not use **Large Intercharacter Gap** with **Narrow Margins** enabled since enabling **Large Intercharacter Gap** (over 3x) could cause a narrow margins (5x) to be interpreted as an intercharacter gap.

Serial Cmd: <**Kq***status,start & stop match,start & stop output match,**large intercharacter gap**,fixed code length status,fixed fixed code length,check digit type,check digit output*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Code Length Status (Codabar)

Definition: When enabled, the scanner will check the label length against the fixed code length field. If disabled any length would be considered a valid label.

Serial Cmd: <**Kq***status,start & stop match,start & stop match output,large intercharacter gap,**fixed code length status**,fixed code length,check digit type,check digit output*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Code Length (Codabar)

Definition: Specifies the exact number of characters that the scanner will recognize (this does not include start and stop and check digit characters). The scanner ignores any code not having the specified length.

Usage: **Fixed Code Length** helps prevent truncations and increases data integrity by ensuring that only one symbol length will be accepted.

Serial Cmd: <**Kq***status,start & stop match,start & stop match output,large intercharacter gap,fixed code length status,**fixed code length**,check digit type,check digit output*>

Default: **10**

Options: 1 to 64

Note: **Fixed Code Length Status** must be enabled for **Fixed Code Length** to take effect.

Note: Because of symbology limitations, setting **Code Length** to any number less than four will produce undetermined results.

Check Digit Type (Codabar)

Definition: Allows the user to select the check digit type Codabar will use.

Serial Cmd: *<**Kq**status,start & stop match,start & stop match output,large inter-character gap,fixed code length status,fixed code length,**check digit type**,check digit output>*

Default: **Disabled**

Options:
0 = Disabled
1 = Modulus 16
2 = NW 7
3 = Both

Modulus 16: Used in the photo-finishing market.

NW 7: Used in Japanese markets.

Check Digit Output (Codabar)

Definition: When enabled, the check digit character is sent along with the bar code data. When disabled, bar code data is sent without the check digit.

Usage: For additional security a check digit can be added to the bar code symbol.

Serial Cmd: *<**Kq**status,start & stop match,start & stop match output,large inter-character gap,fixed code length status,fixed code length,check digit type,**check digit output**>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Interleaved 2 of 5

Definition: A dense, continuous, self-checking, numeric symbology. Characters are paired together so that each character has five elements, two wide and three narrow, representing numbers 0 through 9, with the bars representing the first character and the interleaved spaces representing the second character. (A check digit is highly recommended.)

Important: You must set **Code Length** in order to decode I 2/5 symbols.

Usage: It is has been has been popular because it is the most dense code for printing numeric characters less than 10 characters in length; however Microscan does not recommend this symbology for any new applications because of inherent problems such as truncation.

Interleaved 2 of 5 Status

Serial Cmd: <**Kr*status***,*check digit status,check digit output,code length #1,code length #2*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Check Digit Status (Interleaved 2 of 5)

Definition: An error correcting routine in which the check digit character is added.

Usage: It is typically not used but can be enabled for additional security in applications where the host requires redundant check digit verification.

Serial Cmd: <**Kr***status*,***check digit status***,*check digit output,code length #1,code length #2*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Check Digit Output (Interleaved 2 of 5)

Definition: When enabled, a check digit character is sent along with the bar code data for added data security.

Serial Cmd: <**Kr***status,check digit status,****check digit output****,code length #1,code length #2*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Code Length #1 (Interleaved 2 of 5)

Definition: Allows user to define the symbol length. Because I 2/5 is a continuous code, it is prone to substitution errors. Hence, a code length must be defined and a bar code symbol must contain an even number of digits.

Note: If a start, stop or check digits are used, they are not included in the code length count.

Usage: With I 2/5, two code lengths can be defined. When using only one symbol length in an application, setting **Code Length #2** to 0 (zero) to ensure data integrity is recommended.

Serial Cmd: *<**Kr** status,check digit status,check digit output,**code length #1**,code length #2>*

Default: **10**

Options: 2 to 64, even.

Since I 2/5 characters are paired, code length must be set to an even number. If **Check Digit** is enabled, add 2 to your code length. For example, if your symbol is 10 characters plus a check digit, then enable **Code Length** for 12.

Note: Typically, when printing an I 2/5 label with an odd number of digits, a 0 will be added as the first character.

Code Length #2 (Interleaved 2 of 5)

Definition: Allows user to define a second code length for I–2 of 5.

Usage: If using a second symbol, a zero or any even code length from 2 to 64 may be specified. If not using a second symbol, set Code Length #2 to 0 to ensure data integrity.

Serial Cmd: *<**Kr** status,check digit status,check digit output,code length #1,**code length #2**>*

Default: **6**

Options: 2 to 64, even.

Since I 2/5 characters are paired, code length must be set to an even number. If **Check Digit** is enabled, add 2 to your code length. For example, if your symbol is 10 characters plus a check digit, then enable **Code Length** for 12.

Note: Typically, when printing an I 2/5 label with an odd number of digits, a 0 will be added as the first character.

UPC/EAN

Definition: UPC (Universal Product Code) is a fixed length numeric, continuous symbology. UPC can have two or five digit supplemental bar code data following the normal code. The U.P.C., Version A (U.P.C., A) symbol is used to encode a 12 digit number. The first digit is the number system character, the next five are the manufacturer number, the next five are the product number, and the last digit is the checksum character.

When enabled, the scanner will read UPC version A and UPC version E only.

Usage: Used primarily in POS application in the retail industry. It is commonly used with Microscan scanners in applications in combination with **Matchcode** when there is a need to verify that the right product is being placed in the right packaging.

UPC Status

Serial Cmd: *<**Ks**__UPC status__,EAN status,supplementals status,separator status,separator character>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

EAN Status

Definition: EAN is a subset of UPC. When enabled, the scanner will read UPC version A, UPC version E, EAN 13, and EAN 8. It also appends a leading zero to UPC version A symbol information and transmits 13 digits. If transmitting 13 digits when reading UPC version A symbols is not desired, disable **EAN**.

Note: The extra character identifies the country of origin.

Usage: **EAN** is the European version of the UPC symbology and is used in European market applications.

Note: **UPC** must be enabled for **EAN** to take effect.

Serial Cmd: *<**Ks**UPC status,__EAN status__,supplementals status, separator status, separator character>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Supplementals Status (UPC/EAN)

Definition: A supplemental is a 2 or 5 digit symbol appended to the main label. When set to **Enabled** or **Required**, the scanner reads supplemental bar code data that has been appended to the standard UPC or EAN codes.

Usage: Reads **Supplementals** typically used in publications and documentation.

Serial Cmd: *<**Ks**UPC status,EAN status,**supplementals status**,separator status, separator character>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled 2 = Required

Disabled: UPC **Supplementals** will not be decoded.

Enabled: When enabled, the scanner will try to decode a main and a supplemental. However, if a supplemental is not decoded, at the end of the read cycle, the main will be sent by itself. The UPC main and supplemental symbols are considered to be one symbol and will be treated as such.

Required: When set to **Required** and either the main or supplemental symbol is not read, a single noread condition results. The UPC main and supplemental symbols are treated as one symbol.

For example, if **Supplementals** is set to **Required**, **Separator** is enabled, and an asterisk is defined as the UPC separator character, then the data will be displayed as: MAIN * SUPPLEMENTAL.

Note: Under no circumstances will supplemental symbol data be sent without a main symbol.

Note: If additional symbols—other than the main or supplemental—will be read in the same read cycle, **Number of Labels** should be set accordingly.

Separator Status (UPC/EAN)

Definition: Allows the user to insert a character between the standard UPC or EAN code and the supplemental code when **Supplementals** is set to **Enabled** or **Required**.

Usage: Allows user to distinguish between the main and **Supplemental** symbols.

Serial Cmd: *<**Ks**UPC status,EAN status,supplementals status,**separator status**,separator character>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Separator Character (UPC/EAN)

Definition: Allows the user to change the separator character from a comma to a new character.

Usage: As required by the application.

Serial Cmd: <**Ks***UPC status,EAN status,supplementals status,separator status,****separator character***>

Default: **,** (**comma**)

Options: Any ASCII character

Note: If **Separator Character** has been changed to any other character and you wish to re-define the separator as a comma, you will need to use ESP or the embedded menu.

Note: Whenever **Separator Character** is defined as a comma (,) sending a <**Ks?>** command will return the current definitions including the separator character comma which will appear between two serial separator commas.

PDF417

Definition: A two-dimensional, multi-row (3 to 90), continuous, variable length symbology that has high data capacity for storing up to 2700 numeric characters, 1800 printable ASCII characters, or 1100 binary character per symbol. Each symbol character consists of 4 bars and 4 spaces in a 17-module structure.

Usage: Used in applications where a large amount of information (over 32 characters) needs to be encoded within a symbol, typically where the symbol is transported from one facility to another. For example, an automobile assembly line might use a single label with multiple fields of information that will be read at several stations along the way, without reference to a database.

Serial Cmd: <**K[***status,[ususued],fixed code length status,fixed code length>*

PDF417 Status

Serial Cmd: <**K[*** ***status****,[ususued],fixed code length status,fixed code length>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Code Length (PDF417)

Definition: When enabled, the PDF label must contain the same number of characters as the code length setting before it can be considered a good decode. The scanner will ignore any code not having the specified length.

Usage: Used to increase data integrity by ensuring that only one label length will be accepted.

Fixed Code Length Status (PDF417)

Serial Cmd: <**K[***status,[usused][usused],**fixed code length status**,fixed code length*>
Default: **Disabled**
Options: 0 = Disabled 1 = Enabled

Fixed Code Length (PDF417)

Definition: Specifies the exact number of characters the scanner will recognize.
Serial Cmd: <**K[***status,[usused][usused],fixed code length status,**fixed code length***>
Default: **10**
Options: 1 to 2710

Note: **Fixed Code Length Status** must be enabled for **Fixed Code Length** to take effect.

Code 128

Definition: A very dense alphanumeric symbology. It encodes all 128 ASCII characters; it is continuous, has variable length, and uses multiple element widths measured edge to edge.

Usage: **Code 128** is a smaller code useful in applications with tight spots and high security needs.

Code 128 Status

Serial Cmd: <**Kt*status***,*fixed code length status,fixed code length*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Code Length Status (Code 128)

Definition: When enabled the scanner will check the label length against the code length field. If disabled any length would be considered a valid label.

Serial Cmd: <**Kt***status,**fixed code length status**,fixed code length*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Code Length (Code 128)

Definition: It specifies the exact number of characters that the scanner will recognize (this does not include start and stop and check digit characters). The scanner ignores any code not having the specified length.

Usage: **Fixed Code Length** helps prevent truncations and increases data integrity by ensuring that only one symbol length will be accepted.

Serial Cmd: <**Kt***status,fixed code length status,**fixed code length***>

Default: **10**

Options: 1 to 64

Note: Fixed Code Length Status must be enabled for **Fixed Code Length** to take effect.

UCC/EAN-128

Definition: A subset of Code 128, with extended features.
See the Uniform Code Council, Inc. at ***www.uc-council.org***.

Usage: Used as a standard for shipping labels.

Note: Code 128 must be **Enabled** for UCC/EAN-128 to function.

UCC/EAN-128 Status

Serial Cmd: *<**Kt**,,,**UCC/EAN-128 status**,output format,application record separator status,application record separator character,application record brackets,application record padding>*
Note: Code 128 serial command fields for K precede UCC/EAN-128.

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled 2 = Required

Enabled: If **Enabled,** the scanner can read labels with or without a function 1 character in the first position.

Required: If set to **Required,** the label must have a function 1 in the first position and conform to EAN format in order to decode the bar code symbol.

Output Data Format (UCC/EAN-128)

Definition: Offers an option between **Standard UCC/EAN-128** and **Application Record** format.

Usage: **Application Record** is useful in applications in which the software can utilize application record formatting to help automate the processing of its UCC/EAN-128 data.

Serial Cmd: *<**Kt**,,,UCC/EAN-128 status,**output format**,application record separator status,application record separator character,application record brackets,application record padding>*

Default: **Standard**

Options: 0 = Standard 1 = Application Record

Standard: In **Standard** UCC/EAN-128 application identifiers and data fields are sent, but none of the formatting (separators, parentheses, padding) will be included.

Application Record: **Application Record** is a variation of UCC/EAN-128 that allows the user to define separators between data fields, enclose application identifiers in parentheses, and enable padding (zeros) for variable length fields.

Note: If an illegal **Application Record** format is detected, the scanner will process it as a noread and output a noread message (if enabled).

Application Record Separator Status (UCC/EAN-128)

Definition: When enabled, a separator character is inserted between application records.

Serial Cmd: *<**Kt**,,,UCC/EAN-128 status,output format,**application record separator status,**application record separator character,application record brackets,application record padding>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enable

Note: **Output Format** must be set to **Application Record** before this parameter can take effect.

Application Record Separator Character (UCC/EAN-128)

Definition: Allows the user to define an ASCII character as an application record separator.

Serial Cmd: *<**Kt**,,,UCC/EAN-128 status,output format,application record separator status,**application record separator character**,application record brackets,application record padding>*

Default: **, (comma)**

Options: User Defined ASCII character

Note: **Output Format** must be set to **Application Record** before this parameter can take effect.

Application Record Brackets (UCC/EAN-128)

Definition: When enabled, parentheses ( ) are added to enclose application identifiers.

Serial Cmd: *<**Kt**,,,UCC/EAN-128 status,output format,application record separator status,application record separator character,**application record brackets**,application record padding>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Note: **Output Format** must be set to **Application Record** before this parameter can take effect.

Application Record Padding (UCC/EAN-128)

Definition: Padding is the insertion of zeros to make up the maximum length of a variable application record data field, except for the last field which does not require padding.

When enabled, padding is included. When disabled, padding is omitted.

Note: Padding is never added to fixed length fields or to the last data field of a label. Enabling or disabling **Record Padding** will have no effect on these.

Serial Cmd: <**Kt**,,,*UCC/EAN-128 status,output format,application record separator status,application record separator character,application record brackets,****application record padding***>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Note: **Output Format** must be set to **Application Record** before this parameter can take effect.

Code 93

Definition: Code 93 is a variable length, continuous symbology employing four element widths. Each Code 93 character has nine modules that may be either black or white. Each character contains three bars and three spaces.

Usage: Used occasionally in clinical industry.

Code 93 Status

Serial Cmd: <**K!*status***,*fixed code length status,fixed code length*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Code Length Status (Code 93)

Definition: When enabled the scanner will check the label length against the code length field. If disabled any length would be considered a valid label.

Serial Cmd: <**K!***status,**fixed code length status***,*fixed code length*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Code Length (Code 93)

Definition: Specifies the exact number of characters that the scanner will recognize (this does not include start and stop and check digit characters). The scanner ignores any code not having the specified length.

Usage: **Fixed Code Length** helps prevent truncations and increases data integrity by ensuring that only one symbol length will be accepted.

Serial Cmd: <**K!***status,fixed code length status,**fixed code length***>

Default: **10**

Options: 1 to 64

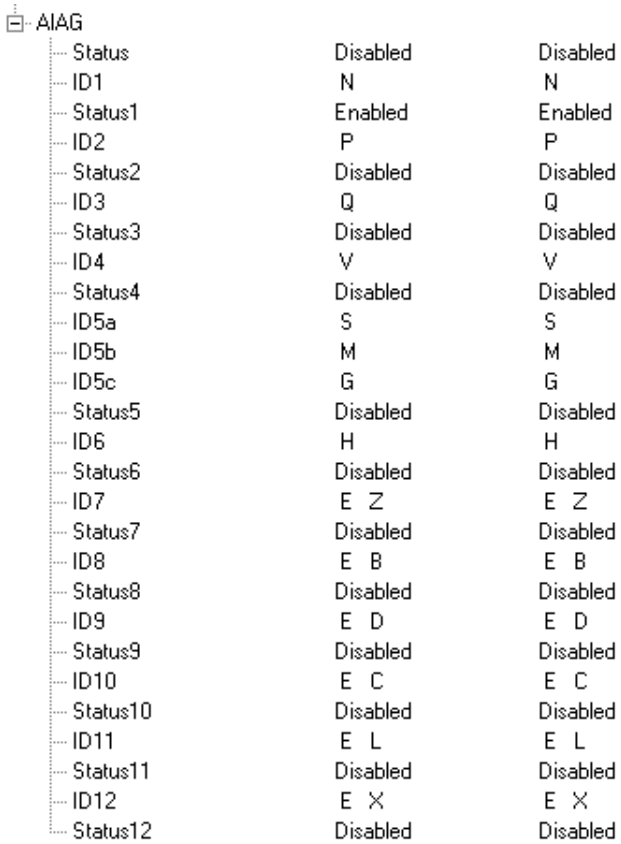
AIAG

Definition: **AIAG** is not a bar code symbology, but rather a standard that enables a user to add information to symbols and to filter data according to user-defined identifiers (up to 12).

AIAG is the Automotive Industry Action Group standard and **is applicable to all symbologies**. If when **AIAG** is enabled a decoded symbol has an AIAG ID, it will be counted. Otherwise, the symbol will be rejected.

Usage: Originally created for identifying and sorting automotive parts and processes, **AIAG** is now used in a wide variety of industries for everything from quality control to data processing.

ESP: From the **Code Type** menu, scroll to **AIAG**.



AIAG Status

Serial Cmd: <**KZ*AIAG status***, *ID1, status1, ID2, status2, ID3, status3, ID4, status4, *ID5a,ID5b,ID5c, status5, ID6, status6, ID7, status7, ID8, status8, ID9, status9, ID9, status10, ID11, status11, ID12, status12*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

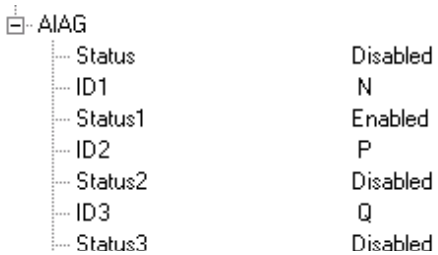
AIAG Identifiers

Definition: AIAG has 12 Identifiers, each of which allows you to enter up to 4 ASCII characters with the exception of ID #5 which allows you enter 3 sub-identifiers of 4 characters each.

Serial Cmd: <**KZ***AIAG status, ID1, status1, ID2, status2, ID3, status3, ID4, status4, *ID5a,ID5b,ID5c, status5, ID6, status6, ID7, status7, ID8, status8, ID9, status9, ID9, status10, ID11, status11, ID12, status12*>

ESP: Each Identifier can be individually changed.

1. **Double-click** on the individual identifier to bring up the screen shown on the right.
2. Select a character and click anywhere in the **Code Type** ESP window.



Default: **Status1** is **Enabled** by default. Status 2 through 12 are **Disabled**.

Options: 1 to 12 status settings; 1 to 12 user-defined identifiers.

Default identifiers for ID1 through ID12 are as follows:

ID1	ID2	ID3	ID4	ID5a	ID5b	ID5c	ID6	ID7	ID8	ID9	ID10	ID11	ID12
N	P	Q	V	S	M	G	H	EZ	EB	ED	EC	EL	EX

The following rules apply:

1. **Number of Labels** <**KZ***number*> must be set to the number of **AIAG** symbols required per read cycle. (The number of AIAG IDs enabled has no effect.)
2. Any noread messages will be added to the end of the output with no ID prefix. For example, the following symbols—S123, N456, P678, and Q987—are scanned in order but the third symbol P678 fails to be decoded. The noread output will appear at the end of the data array, as follows: S123,N456,Q987,**NOREAD**.
3. Symbol output is not sorted.
4. Allows any number of symbols with same ID if the data field is different.

Autodiscriminate

Although **Autodiscriminate** is not a configuration command, but it is included here as a convenient tool for enabling most code types.

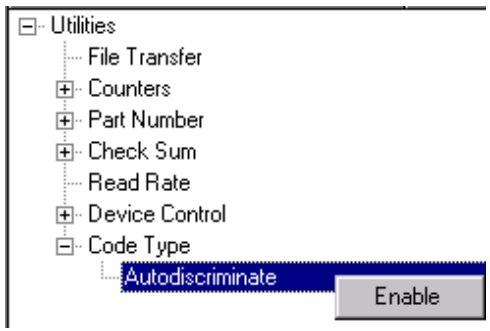
Definition: Enables all available symbology types except PDF417, and UCC/EAN 128. The user may also individually disable/enable each symbology type.

Usage: Commonly used for quick setup mode to detect bar code type. This is particularly useful for users who might be unfamiliar with their application's symbology.

Note: It does not alter individual fields such as **Start/Stop**, **Fixed Length**, etc. These need to be setup individually.

ESP: In the **Utilities** menu, right-click on **Autodiscriminate** and select **Enable**.

Note: There will be a few seconds delay while the scanner values are retrieved.



Serial Cmd: **<P>**

Default: **Code 39** (only)

Options: <P> Enables all codes except noted above.

<Q> Enable Code 39 only

<R> Enable Codabar only

<S> Enable I 2/5 only

Note: If using an I 2/5 label, verify that the number of characters in the label being scanned matches the code length enabled for the I 2/5 code type (default is 10 and 6).

Chapter

6

Scanner Setup

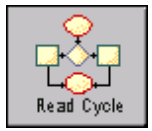
Chapter Contents

Scanner Type 6-5
Scan Speed 6-6
Gain Adjustment 6-7
AGC Sampling 6-8
Transition Counter 6-10

This section includes AGC and factory settings such as **Focus**, **Gain**, **Tracking**, and **Scan Speed.**

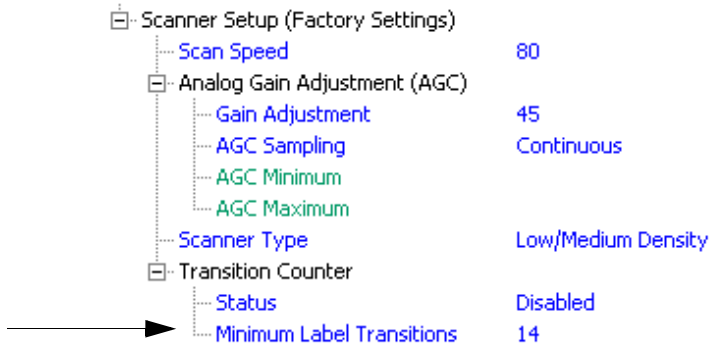
Note: The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Scanner Setup by ESP



Click on this button to bring up the **Scanner Setup** menu.

To change a setting, **double-click** on the setting and use your curser to scroll through the options.



Scanner Setup by Serial Command

Command Title	comds	Format
Scanner Type (factory)	**KP**	<**KP***density*>
Scan Speed (factory)	**KE**	<**KE***scan speed*>
Gain/Sampling	**KD**	<**KD***gain,AGC mode,AGC min,AGC max*>
Transition Counter	**KH**	<**KH***transition counter status,transition counter threshold*>
Scanner Setup Status Request	**KU?**	<**KU?**>

Note: To save F**actory Settings** changes to NOVRAM, send **<Zp>**, or if in ESP, select **Save to Scanner/Advanced/Send and Save, Including Factory**. (See "Save Active Settings including Factory for Power-on" on page A-22.)

Scanner Setup by Embedded Menu

For information on accessing the embedded menus, see "Embedded Menus," on page A-20.

From the Main menu, scroll down through the options and select the following screen:

```
                    CURRENT SETTINGS FOR SCANNER SETUP
------------------------------------------------------------------------------

GAIN ADJUSTMENT (factory) =  45
------------------------------------------------------------------------------
AGC SAMPLING            = CONTINUOUS
SCANS PER SECOND        =  800
TRANSITION COUNTER      = DISABLED
MIN LABEL TRANSITIONS   =  14
BAD BARCODE OUTPUT      = DISABLED
BAD BARCODE MESSAGE     = BADCODE
NO BARCODE OUTPUT       = DISABLED
NO BARCODE MESSAGE      = NOLABEL




------------------------------------------------------------------------------
            ESC = MAIN MENU OR EXIT     N  = NEXT ITEM
            M   = PREVIOUS MENU         SP = NEXT ITEM
            B   = PREVIOUS ITEM         CR = THIS ITEM
------------------------------------------------------------------------------
SCANNER SETUP--> SCANNER TYPE    (factory) = STANDARD/LOW
```

Scanner Type

(factory setting)

Definition:	This field displays the current factory-set scanner density type.
Usage:	This field is **READ ONLY**, and is set by a qualified technician during factory setup.
Serial Cmd:	<**KP*density***>
Default:	The default depends on the type of scanner that was ordered.
Options:	0 = Low/Medium Density 1 = High Density

Scan Speed

(factory setting)

Definition:	Allows the user to set the number of scans per second by controlling the spinning mirror motor speed.
Usage:	Typically, to ensure a minimum number of scans, faster scan speeds are used for fast moving labels and/or longer labels with larger bar widths. See "Formulas for Number of Decodes" on page A-29. **Note:** Scan beams will be moving faster across labels further out in the scan range since the moving beam is being projected from a spinning mirror.
Serial Cmd:	<**KE*scan speed***>
Default:	**80** (x 10 scans per second)
Options:	35 to 110 (x 10 scans per second)

Gain Adjustment

(factory setting)

Definition:	Sets a voltage amplitude value for the analog circuitry.
Usage:	Can be useful for fine-tuning gain or when portions of analog signals spike as in the case of specular reflection or extraneous noise. **Caution**: Changes to **Gain** are typically done by qualified technicians i.
Serial Cmd:	<**KD*gain***,*AGC sampling,AGC min,AGC max*>
Default:	Default is **45** (nominal)**. Gain** is optimized at the factory before shipment; the default value may not be 45.
Options:	10 to 255

AGC Sampling

Definition: AGC is the acronym for Automatic Gain Control. AGC increases the depth of field by attempting to maintain signal strength at a constant level regardless of the range of the bar code label.

AGC Sampling allows you to specify how automatic gain control sampling will be done.

Serial Cmd: <**KD** *gain,**AGC sampling**,AGC min,AGC max*>

Default: **Continuous**

Options: 0 = Disabled 1 = Leading Edge 2 = Continuous

Disabled

Definition: When **AGC Sampling** is set to **Disabled**, gain levels can only be manually controlled by the **Gain** command.

Usage: **Disabled** is not recommended, but can be useful in certain applications in which labels do not require a large depth of field.

Leading Edge

Definition: Finds the leading edge of a symbol by looking for a 40µS quiet zone followed by the number of transitions, stores the highest value of the samples, and adjusts the AGC accordingly at the end of the scan.

Usage: **Leading Edge** is rarely used, but in some cases can improve scan rates when labels are skewed and the leading edge of a label is difficult to locate.

Continuous

Definition: Samples AGC throughout the scan at the rate averages the sample values, and adjusts the AGC value at the end of the scan.

Usage: **Continuous** is the default and the preferred mode for sampling analog signal amplitude.

AGC Minimum

(Read Only)

Definition: Limits the hardware gain available to the software for the usable range.

Serial Cmd: <**KD***gain,AGC sampling,**AGC min**,AGC max*>

AGC Maximum

(Read Only)

Definition: Limits the hardware gain available to the software for the usable range.

Serial Cmd: <**KD***gain,AGC sampling,AGC min,**AGC max***>

Transition Counter

Used for both AGC and label detection routines (see Chapter 8, "Outputs").

Definition: During the read cycle, the scanner counts the number of bar and space transitions defined in the **Transition Counter**. If the count matches or exceeds the threshold, the scanner will perform AGC routines. The results of this test are also made known in output messages.See "Bar Code Output," on page 8-4 and "Bar Code Output," on page 8-4.

Transition Counter Status

Serial Cmd: <**KH** ***transition counter status***,*transition counter threshold*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Transition Counter Threshold

Definition: Determines the number of bar/space transitions that must be read before a label is considered present and AGC can be resolved.

Usage: Can be useful in certain application where extraneous objects in the field of view might require a higher threshold.

Serial Cmd: <**KH** *transition counter status,****transition counter threshold***>

Default: **14**

Options: 1 to 255

Chapter

7

Matchcode

Chapter Contents

Overview of Matchcode 7-4
Using Master Labels 7-5
Matchcode Type 7-6
Master Label Database 7-11
New Master Pin 7-15

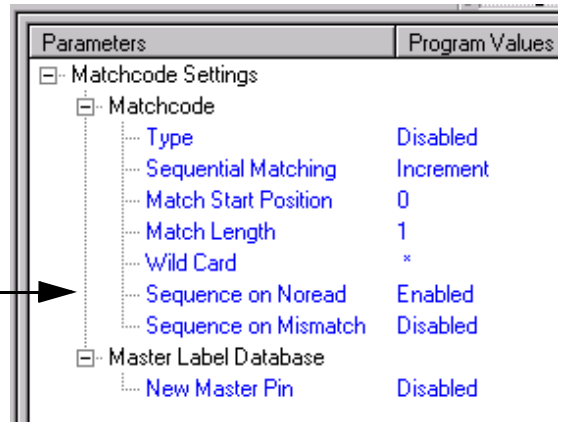
This section explains the matchcode output functions and the master label database setup.

Note: The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Matchcode by ESP

Click this button to bring up the **Matchcode** menu.

To change a setting, **double-click** the setting and use your curser to scroll through the options.



Matchcode by Serial Command

Command Title	cmds	Format
Master label database size	**KM**	<**KM***number of master labels*>
Matchcode Type	**Kn**	<**Kn***type,sequential matching,match start position,match length,wild card character, sequence on noread,sequence on mismatch*>
New Master Pin	**Kz**	<**Kz***status*>
Scan in next label as Master Label.[a]	**G**	<**G***master label number*>
Enter data to database	**M**	<**M***master label number,data*>
Request all Master Label information	**M?**	<**M?**>
Request Master Label information	**M#?**	<**M***master label number***?**>
Delete Master Label	**M,**	<**M***master label number,*>

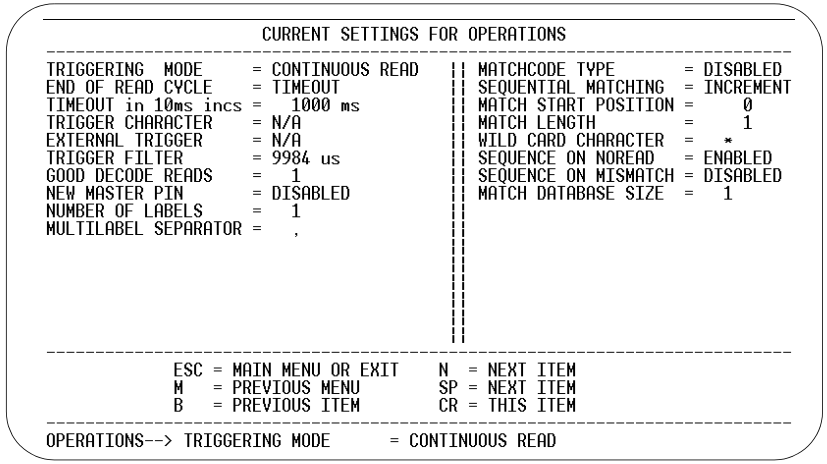
a. If no number is included, the label will be saved to database number 1.

Legacy Commands	Format
Set Matchcode Type to Enabled	<**E**>
Set Matchcode Type to Disabled	<**F**>
Enter data as master label #1	<**)*data*)**>
Request master label #1	<**)**>
Delete master label #1	<**))**>

Matchcode by Embedded Menu

For information on accessing the embedded menus, see "Embedded Menus" on page A-20.

From the Main menu, scroll down through the options and select the following screen:


CURRENT SETTINGS FOR OPERATIONS
TRIGGERING MODE = CONTINUOUS READ
END OF READ CYCLE = TIMEOUT
TIMEOUT in 10ms incs = 1000 ms
TRIGGER CHARACTER = N/A
EXTERNAL TRIGGER = N/A
TRIGGER FILTER = 9984 us
GOOD DECODE READS = 1
NEW MASTER PIN = DISABLED
NUMBER OF LABELS = 1
MULTILABEL SEPARATOR = ,
MATCHCODE TYPE = DISABLED
SEQUENTIAL MATCHING = INCREMENT
MATCH START POSITION = 0
MATCH LENGTH = 1
WILD CARD CHARACTER = *
SEQUENCE ON NOREAD = ENABLED
SEQUENCE ON MISMATCH = DISABLED
MATCH DATABASE SIZE = 1
ESC = MAIN MENU OR EXIT
M = PREVIOUS MENU
B = PREVIOUS ITEM
N = NEXT ITEM
SP = NEXT ITEM
CR = THIS ITEM
OPERATIONS--> TRIGGERING MODE = CONTINUOUS READ

Overview of Matchcode

Definition: With **Matchcode** you can store master label data in the scanner's memory, compare this data against the scanned bar codes, and define how label data and/or discrete signal output will be directed.A master label database can be setup for up to 10 master labels. See "Master Label Database" on page 7-11.

Usage: **Matchcode** is used in applications to sort, route, or verify data based on matching the specific bar code label in a variety of ways as defined in this section. For example, a manufacturer might sort a product based on dates that are embedded in the bar code.

Using Master Labels

1. Set **Triggering Mode** to **External** or **Serial** (see "Trigger Mode" on page 4-4).
2. Chose the method of label comparison that fits your application (see "Matchcode Type" on page 7-6).
3. Enable Matchcode (see "Matchcode Type" on page 7-6).
4. Define the output you want with your matchcode setup:
   a. Barcode output ("Bar Code Output" on page 8-4).
   b. Discrete output (see Chapter 9, "Discrete I/0", and "Output 3" on page 9-6)).
5. Select the number of master labels you want to create, if more than one (see "Master Label Database Size" on page 7-11).
6. Enter master label data in one of the following ways:
   a. Use **ESP** to type in master label data directly into the Utilities menu (see "Master Label Database" on page 11-13).
   b. Send a serial command with label data in the form of **<M*master label#,data*>** (or **<)*data*)>** for single master label only).
   c. Send a **<G*master label number*>** command to scan next label in as the master label.
   d. Enable the **New Master Pin** command and activate a discrete input to store the next label scanned as the master label (see "New Master Pin" on page 7-15).

See also "Master Label Database" on page 7-11 for more information details on entering, requesting, and deleting master labels.

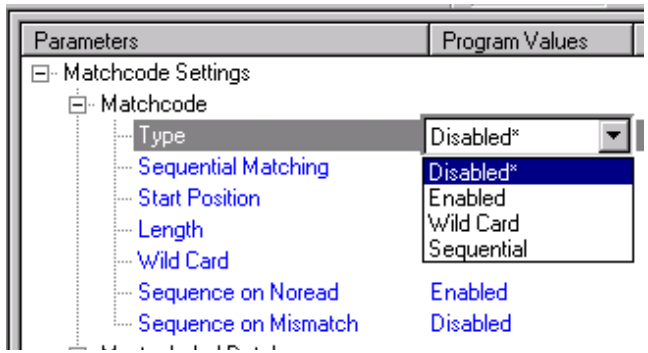
Matchcode Type

Note: When **Matchcode** is set to **Enabled**, **Wild Card** or **Sequential**, **Number of Labels** will default back to **1** (if set to any number greater than 1).

Definition: Allows the user to choose the way that master labels will be compared with subsequently scanned labels.

Note: First set **Triggering Mode** to **External** or **Serial**.

ESP:



Serial Cmd: <**Kn*matchcode type***,*sequential matching,match start position, match length,wild card character,sequence on noread,sequence on mismatch*>

Default: **Disabled**

Options:
0 = Disabled
1 = Enabled
2 = Sequential
3 = Wild Card

Disabled: Has no effect on operations.

Enabled: Instructs the scanner to compare labels or portions of labels with the master label.

Wild Card: Allows the user to enter user defined wild card characters in the master label.

Sequential Matching: Instructs the scanner to sequence after each match (numeric only) and compare labels or portions of labels for sequential numbers.

Note: If **Matchcode Type** is set to **Sequential**, **Number of Labels** will default back to **1** (if set to any number greater than 1).

Sequential Matching

Definition: With **Sequential** enabled, **Sequential Matching** determines if a count is in ascending (incremental) or descending (decremental) order.

Usage: Useful in tracking product serial numbers that increment or decrement sequentially.

Serial Cmd: *<**Kn**matchcode type,**sequential matching**,match start position, match length,wild card character,sequence on noread,sequence on mismatch>*

Default: **Increment**

Options: 0 = Increment
1 = Decrement

Match Start Position

Definition: **Match Start Position** determines the portions of labels that will be matched by defining the first character in the label (from left to right) that will be compared with those of the master label, when **Matchcode Type** is set to **Enabled** or **Sequential**.

Function: For example, if **Match Start Position** is set to 3, the first 2 characters read in the symbol will be ignored and only the 3rd and subsequent characters to the right will be compared, up to the number of characters specified by **Match Length**.

Usage: **Match Start Position** is useful in defining specific portions of a symbol for comparisons. For example, if a symbol contains a part number, manufacturing date, and lot code info but the user is only interested in the part number information. With **Match Start Position** the scanner can be set to only sort on the part number and ignore the rest of the characters.

Serial Cmd: *<**Kn**matchcode type,sequential matching,**match start position**, match length,wild card character,sequence on noread,sequence on mismatch>*

Default: **0**

Options: 0 to 50

Note: **Match Start Position** must be set to **1** or greater to enable this feature. A **0** setting will disable this feature.

Match Length

Definition: Defines the length of the character string that will be compared with that of the master label when **Match Start Position** is set to **1** or greater. when **Match Start Position** is set to **0**, no comparison will occur.

Usage: For example, if **Match Length** is set to **6** in a 10 character symbol, and **Match Start Position** is set for **2**, only the 2nd through 7th characters (from left to right) will be compared.

Serial Cmd: <**Kn***matchcode type,sequential matching,match start position,* ***match length****,wild card character,sequence on noread,sequence on mismatch*>

Default: **1**

Options: 1 to 50

Wild Card Character

Definition: **Wild Card Character** allows a user to define a wild card character as part of the master label.

Usage: For example, with **Wild Card Character** defined as the default asterisk, defining **CR*34** as the master label will result in matches for CR**1**34, CR**2**34, but not CR2345. Entering the wild card at the end of the master label as in **CR*** will result in matches for variable label lengths such as CR**1**, CR**23**, CR**358**, etc.

Serial Cmd: <**Kn***matchcode type,sequential matching,match start position, match length,****wild card character****,sequence on noread,sequence on mismatch*>

Default: ***** (asterisk)

Options: Any valid ASCII character

Sequence On Noread

Definition: When **Sequence On Noread** is **Enabled** and **Matchcode** is set to **Sequential**, the scanner sequences the master label on every match or noread. When disabled, it does not sequence on a noread.

Usage: **Sequence On Noread** is useful when the scanner needs to stay in sequence even if no decode occurs.

Serial Cmd: *<**Kn**matchcode type,sequential matching,match start position, match length,wild card character,**sequence on noread**,sequence on mismatch>*

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

As an example of **Sequence on Noread Enabled**, consider the following series of decodes:

Master label	Decoded label	Master label after decode
001	001	002
002	002	003
003	noread	004 (sequenced on noread)
004	004	005
005	noread	006 (sequenced on noread)
006	noread	007 (sequenced on noread)
007	007	008

As an example of **Sequence on Noread Disabled**, consider the following series of decodes:

Master label	Decoded label	Master label after decode
001	001	002
002	002	003
003	noread	003 (not sequenced)
003	003	004
004	noread	004 (not sequenced)
004	noread	004 (not sequenced)
004	004	005

Sequence On Mismatch

Note: **Matchcode** must be set to **Sequential** for this command to function.

Definition: When set to **Enabled**, the master label sequences on every decode, match or mismatch.

When set to **Disabled**, the master label will not sequence whenever consecutive mismatches occur.

Usage: Enable this parameter if every trigger event should have a decode *and* more than one consecutive mismatch may occur.

Disable this parameter if every trigger event should have a decode but no more than one consecutive mismatch may occur.

Serial Cmd: <**Kn***matchcode type,sequential matching,match start position, match length,wild card character,sequence on noread,****sequence on mismatch***>

Default: **Disabled**

Options: 0 = Disabled, 1 = Enabled

The scanner will sequence the master to one more/less than the decoded symbol. As an example of **Sequence On Mismatch Enabled**, consider the following decodes:

Master label	Decoded label	Master label after decode
001	001	002
002	002	003
003	abc	004 (sequenced on mismatch)
004	004	005
005	def	006 (sequenced on mismatch)
006	ghi	007 (sequenced on mismatch)
007	007	008

As an example of **Sequence On Mismatch Disabled**, consider the following decodes:

Master label	Decoded label	Master label after decode
001	001	002
002	002	003
003	abc	004 (sequenced because of previous match)
004	004	005
005	def	006 (sequenced because of previous match)
006	ghi	006 (not sequenced because of previous mismatch)
006	006	007

You can access **Master Label** operations from the **Utilities** menu.

Master Label Database

Important: **Master Label Database** is used only for comparing entire bar codes, when **Sequential** and **Wild Card** are NOT enabled, and **Start Position** is equal to **0**.

Master Label Database Overview

Definition: Allows you to define up to 10 master labels as the master label database, which can be entered by keyboard, scanned-in, displayed, or deleted by serial or ESP commands.

Usage: Useful where more than one master label is required, as in a **Multilabel** setup, for matching and other matchcode operations.

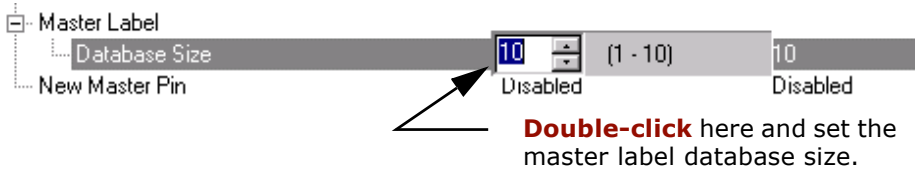
Master Label Database Size

Definition: **Master Label Database Size** allows you to select 1 to 10 master labels for the master label database.

ESP: Click the **Utilities** button

to access the master label:

First set the number of master labels you want to include by double-clicking **Database Size** and entering the number.



Serial Cmd: <**KM *master label database size***>

Default: **1**

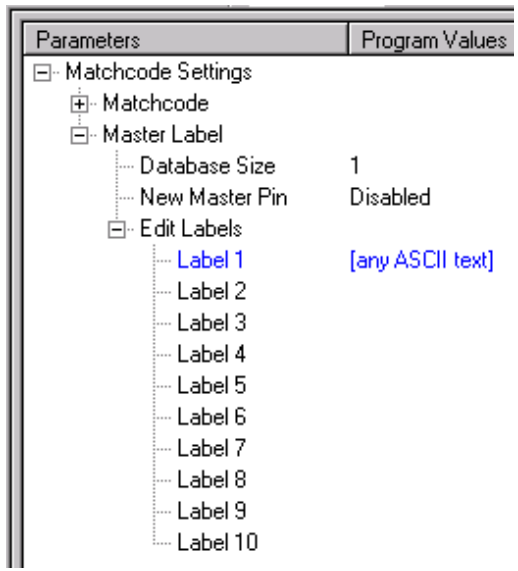
Options: 1 to 10

Enter Master Label Data

Definition: Allows you to enter master label data for a specific master label index number (1 to 10), provided the index number is not larger than the number of labels enabled by the **Master Label Database Size** (see page 7-11). For example, if **Master Label Database Size** is set to 2, you will not be able to enter data for labels 3 through 10.

ESP:

1. Open the **Utilities** menu.
2. Set the number of master labels you want to create in **Database Size**.
3. **Double-click** on each label number you want to setup and copy or type in your data.
4. With your cursor in the label row you have just edited, right-click and choose **Send** or **Send Save**.



Serial Cmd: <***Mmaster label number,master label data***>

Default: ***1, blank***

Options: 1 to 10, data (any combination of ASCII text up to the maximum indicated in "Maximum Characters for Master Label Database" on page 7-13).

For example, to enter data for master label 9, after making certain that master label database size is enabled for 9 or more labels (see "Master Label Database Size" on page 7-11), send <***M9,data***>.

Caution: Since the total number of characters available for the master label database is **2045**, changes to the **Master Label Database Size** will re-allocate the number of characters available for each master label and could cause existing master labels to be deleted (except master label #1 unless it also exceeds the size limitation).

The table below specifies the maximum number of characters available to each label according to the number of master labels defined, from 1 through 10. See "Master Label Database Size" on page 7-11.

Table 7-1 Maximum Characters for Master Label Database

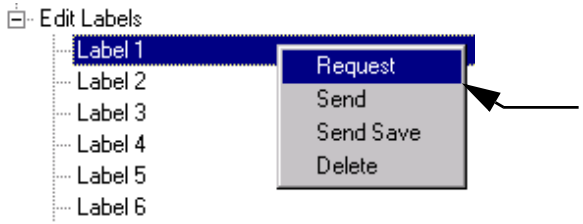
Master Label Number	Maximum Characters
#1	2045
#2	1022
#3	681
#4	510
#5	408
#6	340
#7	291
#8	254
#9	226
#10	203

Request Master Label Data

Definition: Returns master label data for any enabled master labels from 1 to 10. For example, to request master label #5, enter **<M5?>**. The scanner transmits master label #5 data in brackets in the following format: <5/*data*>. If no master label data available, the output will be: <5/>.

ESP: Click the **Utilities** button

to access the master label:



Right-click here and select **Request**.

Serial Cmd: <***Mmaster label number?***>

Default: Returns All master labels if no number is included.

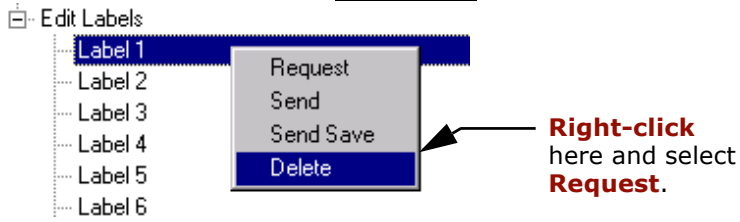
Options: 1 to 10

Delete Master Label Data

Definition: **Delete Master Label Data** allows you to delete any enabled master label.

ESP: Click the **Utilities** button

to access the master label:



Serial Cmd: <**Mmaster label number,**>

Options: 1 to 10

Store Next Label Scanned as Master Label

Definition: After you've set the size in the database, you can order the scanner to scan-in the next label as the master label for any given master label number.

Serial Cmd: <**Gmaster label number**>

To store the next label scanned as master label #1 send: <G> or <G1>. For all labels numbers except 1, the number must be included.

Options: 1 to 10

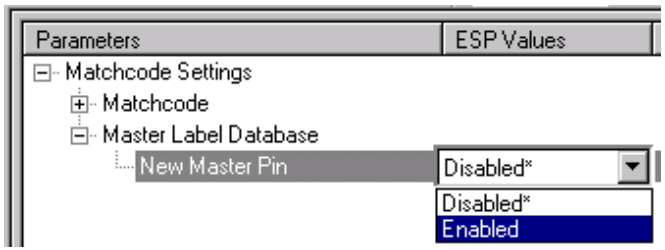
New Master Pin

Definition: After **New Master Pin** is enabled, a pulse can be received on the new master pin which will cause the scanner to record the next decoded bar code label(s) as the new master label(s).

It is important to note that the enabling **New Master Pin** does not in itself cause a master label to be recorded. The master pin must then be activated momentarily (for a minimum of 10 ms) before a master label can be scanned into memory. (See "Electrical Specifications" on page A-6.)

Usage: Some applications require the line worker to change the master label. This can be done by installing a switch at the location of the scanner. It is very common to have a keyed switch so that accidental switching does not occur.

ESP: In the **Utilities** menu, select **New Master Pin**, double-click on **Disabled** and select **Enabled**.



Serial Cmd: <***Kzstatus***>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

After **New Master Pin** has been enabled and the pin activated, decodes will be saved in the master database beginning with master label #1. If the scanner is configured for a multilabel read cycle (**Number of Labels** is greater than 1), the remaining decodes will be saved in each consecutive master label location. For example, if **Number of Labels** is set to **3** and **New Master Pin** is then activated, at the end of the next read cycle, the decoded bar code labels will be saved as master labels 1, 2, and 3.

Chapter

8

Outputs

Chapter Contents

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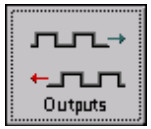
This section explains the commands for controlling data and beeper outputs.

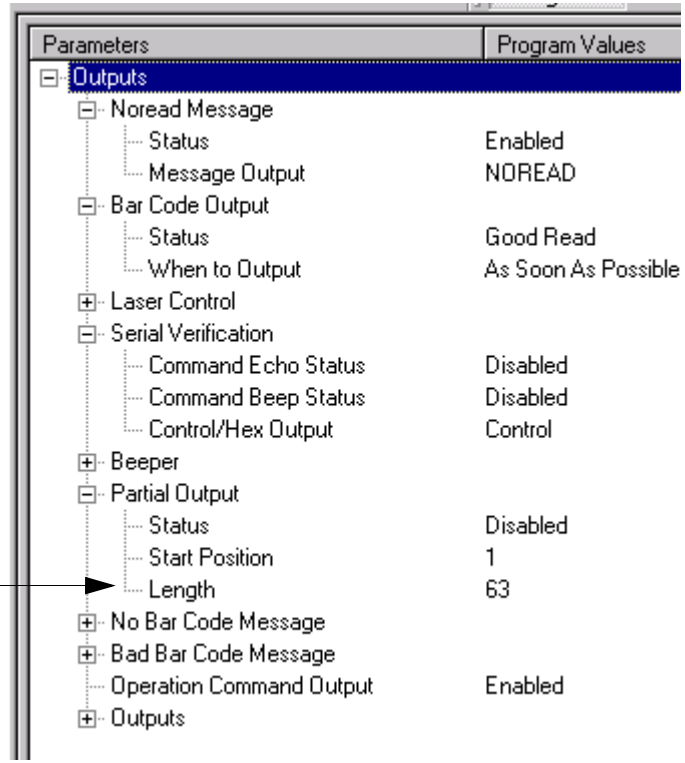
Note: The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Output Data by ESP Menu



Click this button to bring up the **Outputs** menu.

To change a setting, **double-click** the setting and use your curser to scroll through the options.



Outputs by Serial Command

Command Title	cmds	Format
Bar Code Output	**Kl**[a]	<**Kl***status,when to output*>
Noread Message	**Kk**	<**Kk***status,message*>
Bad Bar Code	**K'**	<**K'***status,message*>
No Bar Code	**KN**	<**KN***status,message*>
Laser	**KC**	<**KC***laser on/off status,laser framing status,laser off percentage,laser on percentage*>
Beeper	**Ku**	<**Ku***status,volume*>
Partial Output	**KY**	<**KY***status,start postion,length*>
Serial Verification	**KS**	<**KS***serial command echo status,serial command beep status,control/hex output*>
Operation Command Output	**K/**	<**K/***status*>
Scanner Output Status Request	**KX?**	<**KX?**>

a. Lower case L

Outputs by Embedded Menu

For information on accessing the embedded menus, see "Embedded Menus" on page A-20.

From the Main menu, scroll down through the options and select the following screen:

Note: See also the **Setup** menu for additional outputs that are included in this chapter.

```
                    CURRENT SETTINGS FOR SCANNER OUTPUT
-------------------------------------------------------------------------------
                  |     OUTPUT-1     |     OUTPUT-2     |     OUTPUT-3     |
-------------------------------------------------------------------------------
OUTPUT ON         | MISMATCH/NOREAD  | MISMATCH/NOREAD  | MISMATCH/NOREAD  |
POLARITY          | NEGATIVE         | NEGATIVE         | NEGATIVE         |
PULSE WIDTH       |   50 ms          |   50 ms          |   50 ms          |
# BEFORE OUTPUT   |   1              |   1              |   1              |
-------------------------------------------------------------------------------
BARCODE OUTPUT = GOOD READ          || ECHO K COMMAND    = DISABLED
WHEN TO OUTPUT = ASAP               || BEEP ON K COMMAND = DISABLED
NOREAD MESSAGE = NOREAD             || CTRL CHAR OUTPUT  = CTRL
NOREAD OUTPUT  = ENABLED            || PARTIAL OUTPUT    = DISABLED
BEEPER STATUS  = ON GOOD            || START POSITION    =     1
BEEPER VOLUME  = LEVEL 4            || PARTIAL LENGTH    =    63
FULL SCREENS   = ENABLED            || RESPONSE FORMAT   = FORMATTED
LASER ON/OFF   = DISABLED           ||
                                    ||
-------------------------------------------------------------------------------
            ESC = MAIN MENU OR EXIT    N  = NEXT ITEM
            M   = PREVIOUS MENU        SP = NEXT ITEM
            B   = PREVIOUS ITEM        CR = THIS ITEM
-------------------------------------------------------------------------------
SCANNER OUTPUT--> OUTPUT-1
```

Bar Code Output

Note: **Bar Code Output** relates to data and should not to be confused with **Discrete Outputs** listed in the Chapter 9, "Discrete I/0" which describe output states and functions.

Bar Code Output Status

Definition: Defines the conditions under which decoded bar code labels are transmitted to the host.

Usage: Useful when the host needs bar code data only under certain conditions.

Serial Cmd: <**KI*bar code output status*,***when to output***>

Default: **Good Read**

Options:
0 = Disabled
1 = Match
2 = Mismatch
3 = Good Read

Note: Bar Code Output Status if set to **Match** or **Mismatch** will not take effect unless **Matchcode Type** is enabled and a master label is loaded into memory.

Disabled

Definition: When set to **Disabled**, the scanner will not transmit any data that is generated during a read cycle (bar codes, noreads, etc.).

Usage: It is useful when an application only needs to use the discrete outputs and can allow the scanner to do the decision-making. When **Disabled**, the host does not need the bar code data and the communication lines are used only for setup and status checks.

Match

Definition: When set to **Match**, the scanner transmits bar code data whenever a bar code matches a master label. However, if **Matchcode Type** is **Disabled**, it transmits on any good read.

Note: A noread can still be transmitted if **Enabled**.

Usage: **Match** is used in an application that requires specific bar code information and needs to sort, route or verify based on matching the specific bar code data.

Mismatch

Definition: With **Mismatch** enabled, the scanner transmits bar code data whenever the bar code data information does NOT match the master label.

Note: A noread can still be transmitted if enabled.

Usage: **Mismatch** is typically used as a flag within the host system to prevent an item from being routed in the wrong container.

Good Read

Definition: With **Good Read** enabled, the scanner transmits bar code data on any good read regardless of **Matchcode Type** setting.

Note: A noread can still be transmitted if enabled.

Usage: **Good Read** is used when an application requires all bar code data to be transmitted. It's typically used in tracking applications in which each object is uniquely identified.

When to Output Bar Code Data

Definition: This command allows the user to choose when bar code data can be sent to the host.

Serial Cmd: <**KI***bar code output status,**when to output***>

Default: **As Soon As Possible**

Options: 0 = As Soon As Possible
1 = End of Read Cycle

As Soon As Possible

Definition: Enabling **As Soon As Possible** causes bar code data to be sent to the host immediately after a bar code has been successfully decoded.

Note: More than one decode might in fact be required to qualify as a good decode, depending on how **Decodes Before Output** is set.

Usage: **As Soon As Possible** is useful in applications in which bar code data needs to be moved quickly to the host, typically when the host is making decisions based on bar code data.

End of Read Cycle

Note: See "End of Read Cycle" on page 4-11 for options to end the read cycle.

Definition: Enabling **End of Read Cycle** means that bar code data does not get sent to the host until the read cycle ends with a timeout or new trigger.

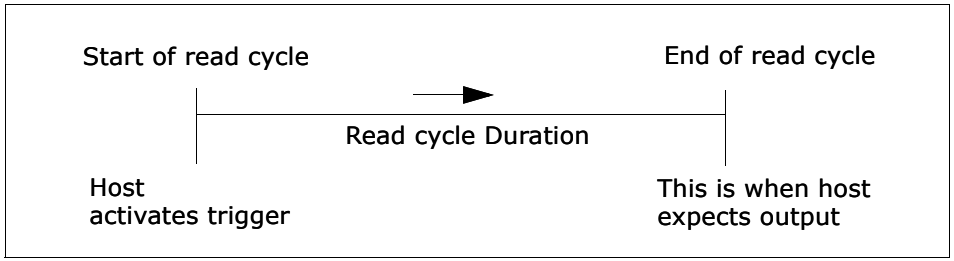


Figure 8-1 Read Cycle

Usage: **End of Read Cycle** is useful in timing-based systems in which the host is not ready to accept data at the time it is decoded.

Message Output

The following flow chart explains the logic paths taken for **Noread**, **Bad Bar Code** and **No Bar Code** outputs.

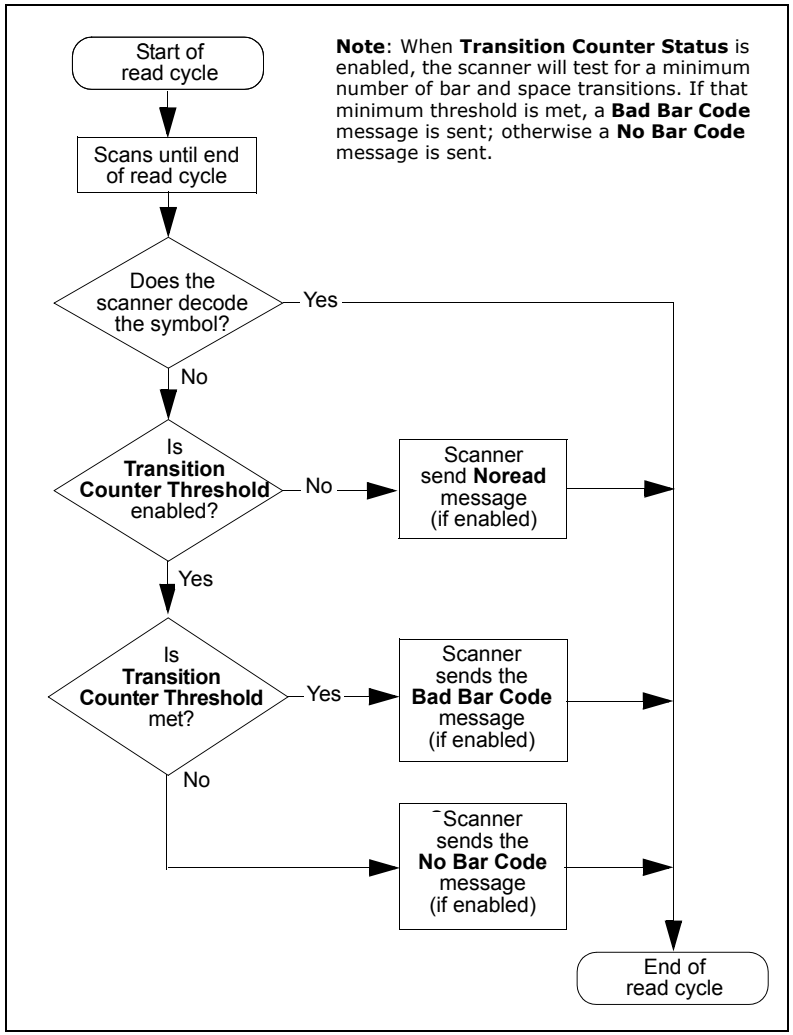

Start of read cycle
Scans until end of read cycle
Does the scanner decode the symbol?
Yes
No
Is Transition Counter Threshold enabled?
No
Scanner send Noread message (if enabled)
Yes
Is Transition Counter Threshold met?
Yes
Scanner sends the Bad Bar Code message (if enabled)
No
Scanner sends the No Bar Code message (if enabled)
End of read cycle
Note: When Transition Counter Status is enabled, the scanner will test for a minimum number of bar and space transitions. If that minimum threshold is met, a Bad Bar Code message is sent; otherwise a No Bar Code message is sent.

Figure 8-2 Output Message Flow

Noread Message

Definition: When enabled, and if no bar code label has been decoded before time-out or the end of the read cycle, the noread message will be transmitted to the host.

Usage: Used in applications where the host needs serial verification that a label has not been read and especially useful in new print verification.

Noread Status

Serial Cmd: <**Kk*status***,*message*>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

Noread Message

Definition: Any combination of ASCII characters can be defined as the noread message.

Serial Cmd: <**Kk***status*,***message***>

Default: **NOREAD**

Options: 0 to 7 ASCII characters.

Note: Noread Message will only be transmitted if **Bar Code Output** (page 8-4) is set to **Match**, **Mismatch** or **Good Read**.

Noread Message can be set to any ASCII characters except **NULL <>** and **,** (comma).

Bad Bar Code Message

Definition: When enabled, a message is sent to the host when a label is detected but not decoded. See "Transition Counter Threshold" on page 6-10.

The **Bad Bar Code** output is tied to the transition counter. If during a read cycle no symbol is decoded and the required setting for the **Transition Sample Threshold** is met, a user defined message will be sent to the host. See "Output Message Flow" on page 8-7.

Usage: Useful in verifying the presence of a bar code label that has not been decoded.

Bad Bar Code Status

Serial Cmd: <**K'*status,***message*>
Default: **Disabled**
Options: 0 = Disabled 1 = Enabled

Bad Bar Code Message

Serial Cmd: <**K'***status,****message***>
Default: **BADCODE**
Options: Up to seven ASCII characters (except NUL)

The **Bad Bar Code** output is tied to the transition counter. If during a read cycle no symbol is decoded and the required setting for the **Transition Sample Threshold** is met, a user defined message will be sent to the host.

No Bar Code Message

Definition: When enabled, sends a message to the host whenever an object is detected but no bar code label is detected. See "Transition Counter Threshold" on page 6-10.

The **No Bar Code** output is tied to the transition counter. If during a read cycle no symbol is decoded and the required setting for the **Transition Sample Threshold** is NOT met, a user defined message will be sent to the host. See "Output Message Flow" on page 8-7.

Usage: Useful in determining if an object has an attached bar code label.

No Bar Code Status

Serial Cmd: <**KN*status***,*message*>
Default: **Disabled**
Options: 0 = Disabled 1 = Enabled

No Bar Code Message

Serial Cmd: <**KN***status*,***message***>
Default: **NOLABLE**
Options: Up to seven ASCII characters (except NUL)

Laser Control

Laser On/Off Status

Definition: When enabled, the laser is ON only during the read cycle. When disabled, the laser operates continuously.

Usage: **Laser On/Off** extends the life of the laser. It is useful where there are significant time gaps between symbols. It also provides visual confirmation of a read cycle duration and minimizes laser exposure to people.

Serial Cmd: <**KC*laser on/off status***,*laser framing status,laser off percentage,laser on percentage*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Laser Framing Status

Definition: Sets the percentage of time the laser is ON during each scan so that only a selected portion of the scan width is effectively scanned.

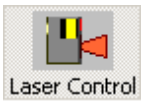
Usage: This is useful to avoid highly reflective objects, for filtering out unwanted signals and avoiding the wrong symbols.

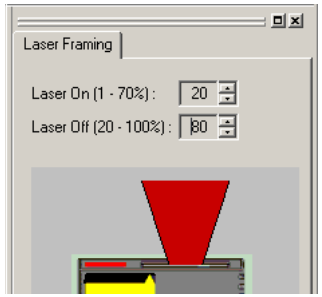
Serial Cmd: <**KC***laser on/off status,****laser framing status***,*laser off percentage,laser on percentage*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

To adjust laser framing, click the **Laser Control** button, and **Laser On/Off** arrows up or down as shown here.





ESP Laser Framing Control

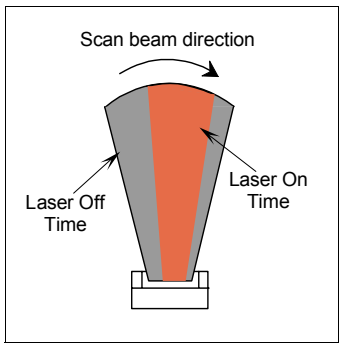


Figure 8-3 Laser Framing Pattern

Note: Because scan widths are not always perfectly symmetrical, the most effective way to setup laser framing is to experiment with the **Laser On Percentage** and **Laser Off Percentage** commands until you get the best results.

Laser Off Percentage

Definition: Percentage of time that the laser is OFF during the scan width sweep.

When **Laser Framing** is disabled, the laser is ON during the full scan. When **Laser Framing** is enabled, the laser remains OFF from the start of the scan and remains OFF for the specified percentage of the scan.

Important: The combined values of **Laser Off Percentage** and **Laser On Percentage** cannot exceed 100 which is the duration of one scan.

Serial Cmd: <**KC***laser on/off status,laser framing status,****laser off percentage****,laser on percentage*>

Default: **20**

Options: 1 to 70

When setting up **Laser Framing** in ESP-MP, use the **Laser Off Percentage** and **Laser Framing On Percentage** arrows to constrain or expand the laser framing area.

Laser On Percentage

Definition: Percentage of time that the laser is ON during the scan width sweep.

Whenever the **Laser Off Percentage** of the laser beam has expired, the **Laser On Percentage** begins and remains ON for the specified percentage of the scan.

Duration of laser on time, in increments of 1/100th of the total scan width sweep.

Important: The combined values of **Laser Off Percentage** and **Laser On Percentage** cannot exceed 100 which is the duration of one scan.

Serial Cmd: <**KC***laser on/off status,laser framing status,laser off percentage,****laser on percentage***>

Default: **80**

Options: 20 to 100

When setting up **Laser Framing** in ESP-MP, use the **Laser Off Percentage** and **Laser Framing On Percentage** arrows to constrain or expand the laser framing area.

Beeper Status

Definition: A beep is emitted either after each good read of a bar code label or after each noread.

Note: Beeper will also sound if any of the following occur:

- the scanner is defaulted
- a send/save command from **ESP** or an **Exit** command from any embedded menu
- a **<Z>**, **<Zp>**, **<Zd>**, or **<KS,1>** command is sent

Usage: Can be used as an audible verification that either a good read or a noread has occurred.

Status

Serial Cmd: <**Ku*status*,***volume***>
Default: **On Good**
Options: 0 = Disabled
1 = On Good
2 = On Noread

Volume

Serial Cmd: <**Ku***status*,***volume***>
Default: **Level 4**
Options: 0 = Off
1 = Level 1
2 = Level 2
3 = Level 3
4 = Level 4
5 = Level 5

Partial Output

Definition: When enabled, allows you to pre-select portions of labels to be transmitted by the scanner.

Usage: In **Multilabel** mode, partial output is performed on each separate label. For example, if **Start Position** is set to 3 and **Partial Length** is set to 5, the following labels are transmitted as follows:

1234567890 as 34567

1234 as 34

123456789,abcde as "34567,cde" (two labels with separator)

12 as [blank]

Status

Serial Cmd: <**KY*status***,*start postion,length*>
Default: **Disabled**
Options: 0 = Disabled 1 = Enabled

Start Position

Definition: Allows you to determine the first character from the beginning of a label to transmit.
Serial Cmd: <**KY***status*,***start postion***,*length*>
Default: **1**
Options: 1 to 2710

Partial Length

Definition: Allows you to determine the number of characters to be transmitted.
Serial Cmd: <**KY***status,start postion*,***length***>
Default: **63**
Options: 1 to 2710

Serial Verification

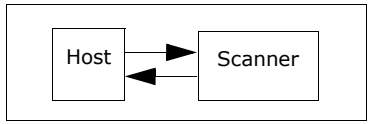
Definition: Allows the user to verify configuration command status.

Usage: These commands are useful in removing any doubt about the scanner's acceptance and response to host configuration commands.

For example, if the current **preamble** is "SOM" and <Kd1, START> is entered, the scanner will echo back <Kd1, SOM> since the attempted entry "START" exceeds the four character limit for that command. Therefore it is rejected and the existing "SOM" message is echoed back and remains the preamble message.

Serial Command Echo Status

Definition: When enabled, a configuration command received from the host is echoed back to the host with the resultant settings.



Function: If a command with multiple fields is processed, some of the fields may have been processed properly while others were not. The changes will appear in the string echoed back so that the user will know which fields did or did not change.

Serial Cmd: <**KS*serial command echo status*,***serial command beep status**,*control/hex output*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Serial Command Beep Status

Definition: Causes the scanner to beep once whenever a K command is entered to indicate that the command was accepted and processed.

Function: If an invalid command is entered, the scanner beeps 5 times to indicate an invalid entry. However, this does not necessarily mean that all data fields have been entered incorrectly. Only one bad field needs to be found in order to activate the 5 beep response.

Usage: Used to audibly verify the acceptance and validity of a command.

Serial Cmd: <**KS***serial command echo status*,***serial command beep status**,*control/hex output*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Control/Hex Output

Definition: Determines the response to an **Serial Command Echo** or status request command.

When set to **Control**, two characters are transmitted to represent a non-displayable character. For example, a carriage return will be shown as the two characters: **^M**.

When set to **Hex**, the output is the hex character.

Usage: Useful for viewing settings with binary characters when using serial command on a terminal.

Serial Cmd: <**KS***serial command echo status,serial command beep status,****control/hex output***>

Default: **Control**

Options: 0 = Control 1 = Hex

Operational Command Output

Definition: Directs the scanner to bracket non-bar code scanner data such as counters with command start and stop characters, and echo the command to the host.

Usage: Useful when brackets are required to delineate certain scanner outputs such as counters.

Serial Cmd: <**K/*status***>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

Chapter

9

Discrete I/0

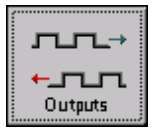
Chapter Contents

Output 1 9-4
Output 2 9-6
Output 3 9-6

This section includes instructions for setting up conditions for changing input/output electrical transitions for control of internal and external devices. A discrete I/O (in/out) signal is an electrical transition from one voltage level to another so that digital switching can occur.

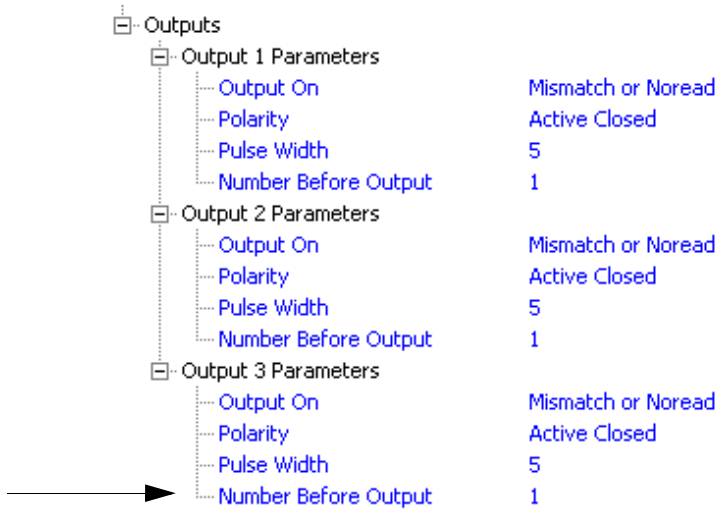
Note: The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Discrete I/O by ESP Menu



Click this button to bring up the **Outputs** menu.

To change a setting, **double-click** the setting and use your curser to scroll through the options.



Discrete I/O by Serial Command

Command Title	cmds	Format
Output 1	**Kv**	<**Kv***output on,active state,pulse width,number to output on*>
Output 2	**Kw**	<**Kw***output on,active state,pulse width,number to output on*>
Output 3	**K`**	<**K`***output on,active state,pulse width,number to output on*>
Scanner Output Status Request	**KX?**	<**KX?**>

Discrete I/O by Embedded Menus

For information on accessing the embedded menus, see "Embedded Menus" on page A-20.

From the Main menu, scroll down through the options and select the following screen:

```
                    CURRENT SETTINGS FOR SCANNER OUTPUT
-------------------------------------------------------------------------------
                  |     OUTPUT-1     |     OUTPUT-2     |     OUTPUT-3     |
-------------------------------------------------------------------------------
OUTPUT ON         | MISMATCH/NOREAD  | MISMATCH/NOREAD  | MISMATCH/NOREAD  |
POLARITY          | NEGATIVE         | NEGATIVE         | NEGATIVE         |
PULSE WIDTH       |   50 ms          |   50 ms          |   50 ms          |
# BEFORE OUTPUT   |   1              |   1              |   1              |
-------------------------------------------------------------------------------
BARCODE OUTPUT = GOOD READ          || ECHO K COMMAND    = DISABLED
WHEN TO OUTPUT = ASAP               || BEEP ON K COMMAND = DISABLED
NOREAD MESSAGE = NOREAD             || CTRL CHAR OUTPUT  = CTRL
NOREAD OUTPUT  = ENABLED            || PARTIAL OUTPUT    = DISABLED
BEEPER STATUS  = ON GOOD            || START POSITION    =     1
BEEPER VOLUME  = LEVEL 4            || PARTIAL LENGTH    =    63
FULL SCREENS   = ENABLED            || RESPONSE FORMAT   = FORMATTED
LASER ON/OFF   = DISABLED           ||
                                    ||
-------------------------------------------------------------------------------
             ESC = MAIN MENU OR EXIT    N  = NEXT ITEM
             M   = PREVIOUS MENU        SP = NEXT ITEM
             B   = PREVIOUS ITEM        CR = THIS ITEM
-------------------------------------------------------------------------------
SCANNER OUTPUT--> OUTPUT-1
```

Output 1

Definition: Sets the discrete output functions for specific user-selected conditions.

Usage: This option provides switching to host software to control external devices such as PLCs and relays. It is useful for routing and sorting and to prevent mis-packaging and mis-routing.

Output On

Definition: Allows the user to set the conditions under which an output (or outputs) will be activated.

Serial Cmd: <**Kv*output on***,*active state,pulse width,number to output on*>

Default: **Mismatch or Noread**

Options:
0 = Mismatch or Noread
1 = Match (or good read)
2 = Mismatch
3 = Noread

Note: If **Output On** is set to **Mismatch Or Noread**, **Match**, or **Mismatch**, a transition (switching) will not occur unless **Matchcode Type** is enabled and a master label is loaded into memory.

Mismatch or Noread

Definition: Activates discrete output when the bar code data does not match that of the master label or the bar code has not been decoded before the end of the read cycle.

Match

Definition: Activates a discrete output when the bar code data matches the master label.

Note: If you want to output for a good read and **Matchcode** is not enabled, you can enable any output for **Match**.

Mismatch

Definition: Activates a discrete output whenever the bar code data does not match that of the master label.

Noread

Definition: Activates a discrete output whenever the bar code data is not decoded before the end of the read cycle.

Active State

Definition: Sets the active state of the discrete output.
Serial Cmd: <**Kv***output on,**active state**,pulse width,number to output on*>
Default: **Normally Open**
Options: 0 = Normally Open
1 = Normally Closed

Pulse Width

Definition: Sets the time in 10 mS increments that the discrete output remains active.
Serial Cmd: <**Kv***output on,active state,**pulse width**,number to output on*>
Default: **5** (.05 seconds). Corresponds to 50 mS displayed in the menu.
Options: 1 to 255 (0.01 to 2.55 seconds). Divide the number entered on the command line by 100 for time in seconds.

Number to Output On

Definition: Sets the number of events (matches, mismatches, noreads, etc. as configured by **Output On**) that must occur before activating the associated output.
Usage: For example, if **Number to Output On** is set to 3 and **Output 1** is set to **Noread**, then **Output 1** will not be activated until 3 noreads have occurred.
Serial Cmd: <**Kv***output on,active state,pulse width,**number to output on***>
Default: **0**
Options: 0 to 255

Output 2

Serial Cmd: <**Kw***output on,active state,pulse width*, *number to output on*>

Output 2 has the same parameters and default settings as **Output 1**.

Output 3

Serial Cmd: <**K`***output on,active state,pulse width*,*number to output on*>

Output 3 has the same parameters and default settings as **Output 1**.

Chapter

10

Diagnostics

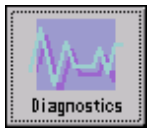
Chapter Contents

Warning Messages 10-4
High Temperature Threshold 10-8
Low Temperature Threshold 10-9
Lifetime Hours 10-10
Present Ambient Temperature (deg. C) 10-11
Counts 10-12
Time Since Last Reset 10-13

Important: Since **Warning Messages** and **NOVRAM Messages** are not enabled by default, these messages will not be displayed. However, if you suspect that erroneous defaults are occurring, enable **Warning Messages** and **NOVRAM Messages** by sending **<K"1,,,1>**.

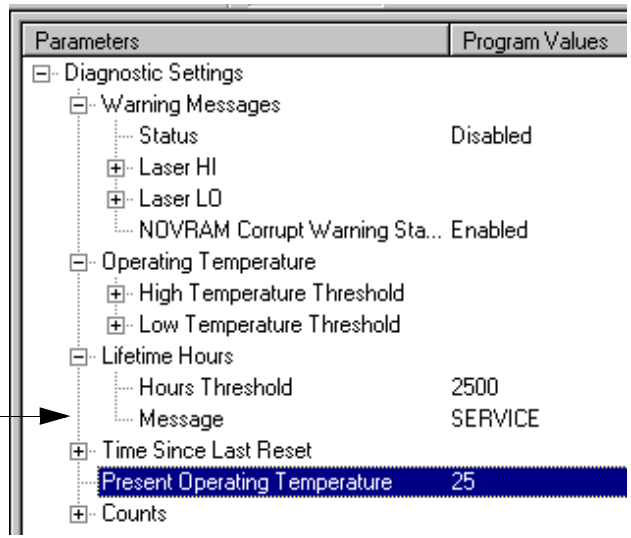
Note: The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Diagnostics by ESP Menu



Click this button to bring up the **Diagnostic** menu.

To change a setting, **double-click** the setting and use your curser to scroll through the options.

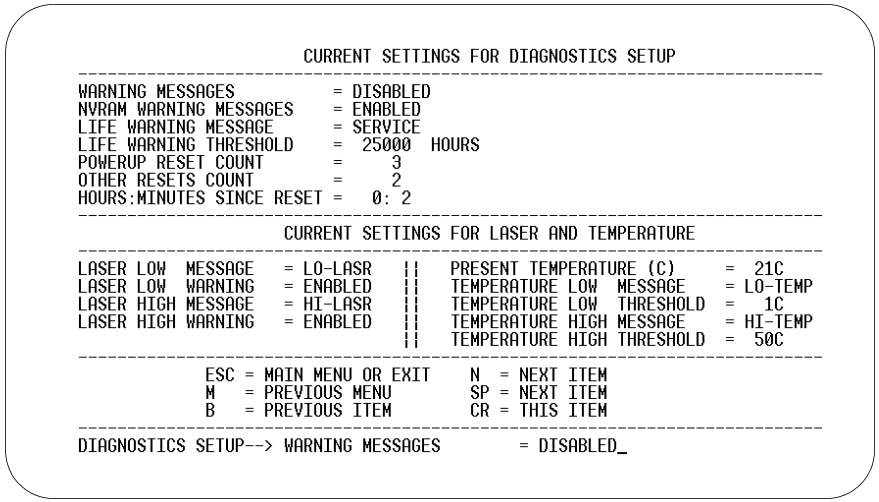


Diagnostics by Serial Command

Command Title	Cmds	Format
Warning Message Status	**K"**	<**K"***warning message status,laser high status,laser low status,novram/reset warning status*>
Laser Overcurrent	**K;**	<**K;***message*>
Laser Undercurrent	**K:**	<**K:***message*>
Over-temperature	**K+**	<**K+***degrees,message*>
Under-temperature	**K-**	<**K-***degrees,message*>
Lifetime Hours	**K$**	<**K$**hours10,message>
Present Operating Temperature	**K%?**	<**K%?***deg*> *(read only)*
Power On/Resets Counts	**K_**	<**K_***powerups,resets*>
Time Since Last Reset	**K@?**	<**K@?***hours,minutes*> (read only)

Diagnostics by Embedded Menu

For information on accessing the embedded menus, see "Embedded Menus" on page A-20.
From the Main menu, scroll down through the options and select the following screen:


CURRENT SETTINGS FOR DIAGNOSTICS SETUP
WARNING MESSAGES = DISABLED
NVRAM WARNING MESSAGES = ENABLED
LIFE WARNING MESSAGE = SERVICE
LIFE WARNING THRESHOLD = 25000 HOURS
POWERUP RESET COUNT = 3
OTHER RESETS COUNT = 2
HOURS:MINUTES SINCE RESET = 0: 2
CURRENT SETTINGS FOR LASER AND TEMPERATURE
LASER LOW MESSAGE = LO-LASR
LASER LOW WARNING = ENABLED
LASER HIGH MESSAGE = HI-LASR
LASER HIGH WARNING = ENABLED
PRESENT TEMPERATURE (C) = 21C
TEMPERATURE LOW MESSAGE = LO-TEMP
TEMPERATURE LOW THRESHOLD = 1C
TEMPERATURE HIGH MESSAGE = HI-TEMP
TEMPERATURE HIGH THRESHOLD = 50C
ESC = MAIN MENU OR EXIT
M = PREVIOUS MENU
B = PREVIOUS ITEM
N = NEXT ITEM
SP = NEXT ITEM
CR = THIS ITEM
DIAGNOSTICS SETUP--> WARNING MESSAGES = DISABLED_

Warning Messages

Important Note: **Warning Message Status** must be enabled before any warnings in this menu can be displayed.

Definition: Warning messages that relate to the environment and condition of the scanner can be defined and set to activate specific outputs.

Note: When enabled, the error condition will override all other operational modes configured for the output.

When enabled, laser current and NOVRAM warning messages will be transmitted to the host or any active port whenever the pre-defined conditions are met.

Usage: These messages serve as a flag to service a scanner or as an early warning that potential problems could arise. They are particularly useful in factories that run 24/7 and can't afford down time.

Serial Cmd: *<**K"**warning message status,laser high status,laser low status, novram/reset warning status>*

Warning Message Status

Function: When enabled, warning messages will be transmitted to the host or any active port.

Note: This option must be enabled before any other warning messages can be transmitted.

Usage: Alerts the user to impending failures or conditions that may soon cause failures.

Serial Cmd: *<**K"warning message status**,laser high status,laser low status, novram/reset warning status>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Laser High Warning

Transmits a message whenever the laser current exceeds a factory-calibrated reference value which cannot be altered. The message repeats once every 30 minutes until the condition is corrected.

Laser High Status

Definition: Enables the **Laser High** message.
Usage: Alerts the user to impending laser failure. (Contact Microscan Service.)
Serial Cmd: <**K"***warning message status,***laser high status***,laser low status, novram/reset warning status*>
Default: **Enabled**
Options: 0 = Disabled 1 = Enabled

Laser High Message

Definition: Defines the **Laser High** message.
Serial Cmd: <**K;*laser high message***>
Default: **HI-LASR**
Options: Any 1 to 10 character ASCII string except NUL, <, or >.

Laser Low Warning

When enabled a message up to 10-characters is transmitted whenever the laser current falls below a factory-calibrated reference value which cannot be altered. The message repeats once every 30 minutes until the condition is corrected.

Laser Low Status

Definition: Enables the **Laser Low** message.
Usage: Alerts the user to impending laser failure. (Contact Microscan Service.)
Serial Cmd: <**K"***warning message status,laser high status,**laser low status**, novram/reset warning status*>
Default: **Enabled**
Options: 0 = Disabled 1 = Enabled

Laser Low Message

Definition: When enabled a message up to 10-characters is transmitted whenever the laser current falls below a factory-calibrated reference value which cannot be altered. The message repeats once every 30 minutes until the condition is corrected.

Defines the **Laser Low** message.
Serial Cmd: <**K:***laser low message*>
Default: **LO-LASR**
Options: Any 1 to 10 character ASCII string except NUL, <, or >.

NOVRAM Corrupt Warning Status

When enabled, a 7 character message is sent whenever the system detects a warning condition.

Important Note: **Warning Corrupt Message Status** must be enabled before the **NOVRAM** message in this menu can be transmitted.

Function:	When enabled, a 7 character message is sent whenever the system detects a warning condition. However, if you suspect that erroneous defaults are occurring, enable **NOVRAM Messages** by sending **<K1,,,1>**. This will allow the **NOVRAM** messages, if present, to be viewed.
Usage:	Alerts the user to NOVRAM failure. (Contact Microscan Service.)
Serial Cmd:	<**K"***warning message status,laser high status,laser low status,* ***novram reset warning status***>
Default:	**Enabled**
Options:	0 = Disabled 1 = Enabled

Warning messages for NOVRAM can appear in one of five formats:

<*NVRAM-C*>

This message indicates an error in user settings. The message repeats once every 30 minutes. If this message is received, restore customer settings and send a **<Z>** command.

If the condition persists, call customer service.

<*NVBAD-D*>

Indicates that diagnostic lifetime hours, power-on counts, and reset counts have been lost. The message repeats once every 30 minutes. (Contact Microscan Service.)

<*NVBAD-L*>

Indicates a problem with laser current factory reference. The message repeats once every 30 minutes. (Contact Microscan Service.)

<*DFALT-C*>

Indicates that the customer NOVRAM settings have been defaulted either by a customer initiated default or by a problem with the scanner. This message is sent ONLY ONCE.

<*DFALT-F*>

Indicates that the factory NOVRAM settings have been defaulted. This message is sent ONLY ONCE upon reset. (Contact Microscan Service.)

High Temperature Threshold

A message can be defined that will display when a user-set **High Temperature Threshold** has been reached. The message repeats once every 30 minutes until the condition is corrected. This value is a reference to the external ambient temperature in the environment around the scanner.

High Temperature Degrees

Definition:	A user can set a temperature value that when exceeded will cause a high temperature message to be displayed. If **High Temperature Threshold** is set to zero, then the warning message will be disabled
Usage:	Helps ensure that the scanner is being used within its temperature specification. Also, since hotter environments tend to shorten the life of electronics components, a user may want to set the temperature threshold closer to the nominal temperature of 25°.
Serial Cmd:	<**K+*degrees***,*message*>
Default:	**50° Celsius**
Options:	0° to 50°, zero disables.

High Temperature Message

Definition:	The user can enter a 10-character message that will be displayed whenever **High Temperature Threshold** is exceeded.
Serial Cmd:	<**K+***degrees*,***message***>
Default:	**HI-TEMP**
Options:	Any 1 to 10 character ASCII string except **NUL, <, or >**.

Low Temperature Threshold

A message can be defined that will display when a user-set **Low Temperature Threshold** has been reached. The message repeats once every 30 minutes until the condition is corrected. This value is a reference to the external ambient temperature in the environment around the scanner.

Low Temperature Degrees

Definition:	The user can set a low temperature value that whenever the ambient temperature falls below it causes a low temperature message to be displayed. If **Low Temperature Threshold** is set to zero, the warning message will be disabled.
Usage:	Helps ensure that the scanner is being used within its temperature specification.
Serial Cmd:	<**K–*degrees***,*message*>
Default:	**1°** Celsius
Options:	0° to 50°, zero disables.

Low Temperature Message

Definition:	The user can enter a 10-character message that will be displayed whenever the ambient temperature falls below the **Low Temperature Threshold**.
Serial Cmd:	<**K–** *degrees*,***message***>
Default:	**LO-TEMP**
Options:	Any 1 to 10 character ASCII string except NUL, <, or >.

Lifetime Hours

A message can be defined that will be transmitted whenever the scanner's elapsed time clock exceeds the set hours threshold. The message repeats one time every 30 minutes.

Hours Threshold

Definition: A user can set a time in hours that will cause a message to be sent whenever the scanner's run time exceeds this value.

The elapsed time is the time the scanner is powered up.

Usage: Useful for setting up a preventive maintenance program.

Serial Cmd: <**K$*hours10***,*message*>

Default: **2500** (x 10 = 25,000 hours)

Options: 0 to 65534

Note: Hours entered are 1/10 of the actual hours.

Message

Definition: A user can define message up to 10-characters that will be displayed whenever the hours threshold is reached or exceeded.

Serial Cmd: <**K$***hours10*,***message***>

Default: **SERVICE**

Options: Any 1 to 10 character ASCII string except NUL, <, or >.

Present Ambient Temperature (deg. C)

(This command is READ ONLY.)

Definition: Indicates temperature of the environment immediately outside of the scanner.

A thermal sensor on the main PCB measures the internal temperature of the scanner. From this a case-differential constant is subtracted to yield an estimated external temperature.

Usage: Useful for setting **Over Temperature Threshold** and **Under Temperature Threshold**.

Serial Cmd: Send: **<K%?>**

Returns <**K%** *degrees Celsius*>.

Note: When viewing the **Present Operating Temperature**, allow at least 20 minutes after startup for the scanner's inside and outside temperatures to stabilize.

Counts

(These commands are READ ONLY.)

Powerups

Definition	Returns the number of times the scanner has been re-powered or a watchdog reset occurs.
Usage:	Useful for detecting unwanted resets caused by power supply problems or ESD transients.
Serial Cmd:	Send <**K_**> Returns <**K_ *powerups*,*resets***>
Read Only Ranges:	0 to 65,535 powerups, 0 to 65,535 resets.

Resets

Definition	Resets include watchdog reset, <A>, <Z>, <Zd>, and hardware defaults. A watchdog reset is a reset that is forced whenever the software locks-up.
Usage:	Useful for detecting unwanted resets caused by power supply problems or ESD transients.
Serial Cmd:	Send <**K_**> Returns <**K_ *powerups*,*resets***>
Read Only Ranges:	0 to 65,535 powerups, 0 to 65,535 resets.

Time Since Last Reset

(This command is READ ONLY.)

Definition:	Records the number of hours and minutes of operation since the last system reset.
Usage:	Useful as a troubleshooting tool that can help pinpoint the cause of a reset.
Serial Cmd:	Send **<K@?>** Returns <**K@** ***hours,minute***s>
Read Only Ranges:	0 to 23 hours, 0 to 59 minutes.

Chapter

11

Utilities

Chapter Contents

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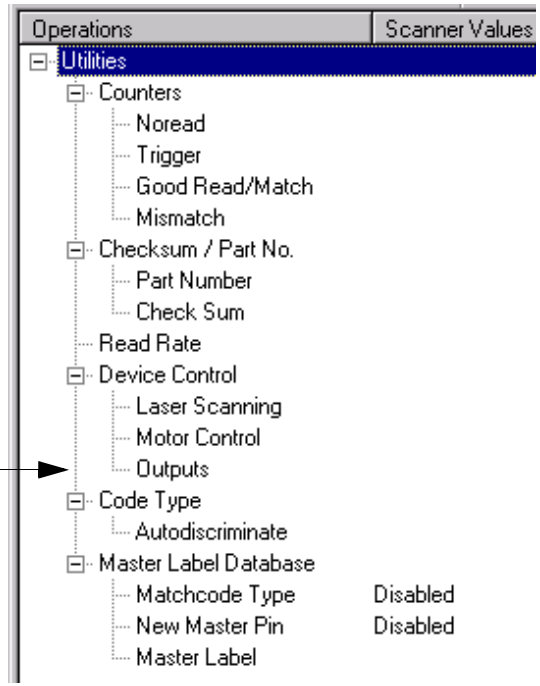
Utility commands are generally commands that are performed during scanner operations to check read rates, determine read rates or perform miscellaneous operations on scanner hardware. Serial utility commands are not prefaced with a "K". Nor do they require an initialization command (<A> and <Z>). They can be entered from within any terminal program or from within ESP-MP in the **Terminal** window.

Note: The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Utilities by ESP Menu

Click this button to bring up the **Utilities** menu

To change a setting, **right-click** the setting and use your curser to scroll through the options.



Note: Utility commands are not accessible by embedded menus.

Utilities by Serial Command

Table 17-1 Summary of Utility Serial Commands

Command Type	Command	Name
Counters	<N>	Noread Counter
	<O>	Noread Counter Reset
	<T>	Trigger Counter
	<U>	Trigger Counter Reset
	<V>	Good Read/Match Counter
	<W>	Good Read/Match Counter Reset
	<X>	Mismatch Counter
	<Y>	Mismatch Counter Reset
Part #/Checksum	<!>	Display Checksums of EPROM Flash memory
	<!b>	Display Checksum for Boot Code
	<!a>	Display Checksum for Application Code
	<#>	Display Part Numbers
	<#b>	Display Boot Code Part Number
	<#a>	Display Application Code Part Number
Read Rate	<Cp>	Enter Single Label Percent Rate Test
	<C>	Enter Single Label Decode Rate Test
	<Cm>	Enter Multilabel Percentage Rate Test
	<Cs>	Enter Multilabel Decode Rate Test
	<a1>	PDF Information
	<J>	Exit Decode Rate and Percent Rate Test
Device Control	<H>	Enable Laser Scanning
	<I>	Disable Laser Scanning
	<KE>	Motor On
	<KF>	Motor Off
	<L1>	Programmable Output 1
	<L2>	Programmable Output 2
	<L3>	Programmable Output 3
Code Types	<P>	Autodiscriminate All Codes
	<Q>	Enable Code 39 Only
	<R>	Enable Codabar Only
	<S>	Enable I 2/5 Only
Trigger	<char>	Serial Trigger Character
Restore/Save	<A>	Reset (does not save for power-on)
	<Ad>	Restore Default Settings
	<An>	Restore Saved Settings
	<Z>	Reset/Save (for power-on)
	<Zp>	Save Factory Settings
	<Zd>	Save/Restore Factory Defaults

See Appendix M — "Defaulting/Saving/Initializing" on page A-75

Table 11-1 Summary of Utility Serial Commands

Master Label	**<E>**	Enable Master Label
	<F>	Disable Master Label
	<)*data***)>**	Enter label data as master label.
	<**M***master label number,data*>	Enter data to database for specified label*
	<M#?>	Request master label data for specific label
	<M?>	Request all master label information
	<)>	Request master label information
	<))>	Delete Master Label
	<**M***master label number,*>	Delete Master Label
Status Requests	**<?>**	Scanner Status
	<?1>	Extended Scanner Status
	<K?>	Configuration Status

File Transfer

File transfer is used to download application code to the scanner.

Application code versions are specific to your scanner. Consult with your sales representative before downloading application code. If needed, an application code will be sent to you in the form of a ***.mot** file.

To download application code:

1. First make sure the host is connected to your scanner.
2. Apply power to the scanner.
3. In the **Utilities** window, right-click on **File Transfer** and select **Download/App Code**.

   This will open a file dialog box.
4. Navigate to the appropriate file (a ***.mot** file) and open the file.

As application code begins to download to the scanner, the scanner will go silent, the scanner's RDY and GD/RD LEDs will flash intermittently, and a progress indicator at the bottom of the ESP window will let you know when the download is complete.

Caution: Do not interrupt power or disconnect the host cable while download is in progress.

Counters

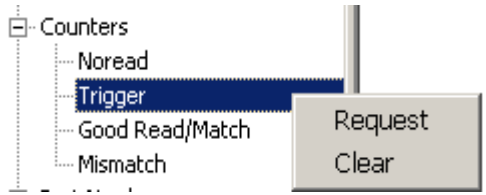
Counter commands can be a numeric value from 00000 to 65,535. After reaching the maximum numeric limit of 65,535, the counter will automatically roll-over and start counting again at 00000. To obtain the cumulative total of counts after the roll-over has occurred, add 65,536 per each roll-over (the scanner does not keep track of the number of roll-overs) to the current count.

Note: All counter values will be lost if power is recycled to the scanner or the scanner receives a reset or save command.

By ESP

You can access **Counters** from the **Utilities** menu.

Right-click the appropriate counter option and select **Request** to display count or **Clear** to set counter to zero. Or, right-click on **Counters** and select **Request All**.



By Serial Command

Noread Counter

Sending **<N>** displays the total number of noreads that have occurred since the last reset.

Noread Counter Reset

Sending **<O>** sets Noread Counter to 00000.

Trigger Counter

Sending **<T>** displays the total number of triggers since the last reset.

Trigger Counter Reset

Sending **<U>** sets the trigger counter to 00000.

Good Read/Match Counter

Sending **<V>** displays the total number of good reads matching the master label or, if Master Label is not enabled, the number of good reads since the last reset. This counter is always enabled, but will only work as a match count when Master Label is enabled. If Master Label is not enabled, this counter records the number of good reads. This count can be requested at any time.

Good Read/Match Counter Reset

Sending **<W>** sets the Match Counter to 00000.

Mismatch Counter

With Matchcode enabled sending **<X>** displays the number of decoded labels since the last reset that do not match the master label.

Mismatch Counter Reset

Sending **<Y>** sets the Mismatch Counter to zero.

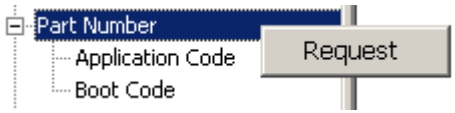
Part Number

You can send a request to the scanner for associated part numbers.

By ESP

You can access **Part Numbers** from the **Utilities** menu.

Right-click **Part Number** and select **Request** to see the associated part number.



By Serial Command

Upon sending **<#>** the scanner returns software part numbers for application code <#a/_____> and boot code <#b/_____>.

Individual part numbers for **Application Code** and **Boot Code** are returned when their respective commands **<#a>** and **<#b>** are sent.

Checksum

A Checksum verifies a scanner's flash memory.

By ESP

You can access **Checksum** from the **Utilities** menu.

Right-click **Checksum** and select **Request** to see the associated check sum number.

By Serial Command

Upon sending **<!>** the scanner returns two 4-digit hex numbers that are the check sums for boot code and the application code.

Individual checksums for **Boot Code** and **Application Code** are returned when their respective commands **<!b>** and **<!a>** are sent.

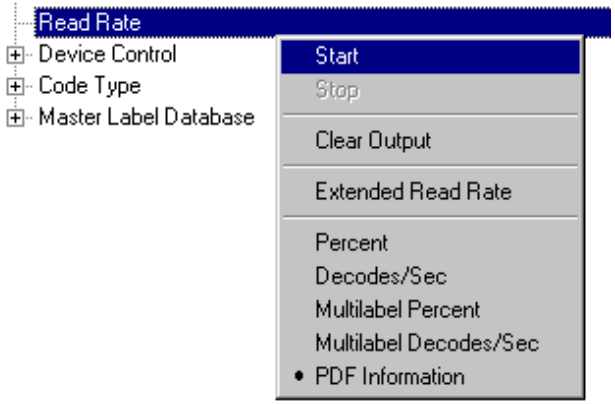
Read Rate

By ESP

You can access **Read Rate** from the **Utilities** menu.

To start or end a read rate test, right-click **Read Rate** and select **Start** or **Stop**.

To change from percent read rate to decodes per second, first end the read rate by selecting **Stop**, then right-click select **Decodes/Sec**.



By Serial Command

Enter Single Label Decodes/Second Test

Sending **<C>** instructs the scanner to transmit the decodes per second and label data (if any). The decode rate can vary dramatically due to the angle and location of the label in relation to the scan line. This test is very useful in aligning and positioning the scanning device during installation.

Enter Single Label Percent Test

Sending **<Cp>** instructs the scanner to transmit the percentage of decodes and any scanned label data.

Enter Multilabel Percent Test

Sending **<Cm>** instructs the scanner to transmit the percentage of scans decoded and label data (if any) for multiple labels.

Enter Multilabel Decode Rate Test

Sending **<Cs>** instructs the scanner to transmit the decode rate and label data (if any) for multiple labels.

End Read Rate Test

Sending **<J>** ends both the **Percent** test and the **Decodes/Second** test for both single and multi-label.

Enable PDF Information

Sending the **<a1>** check box will cause PDF417 symbology data to be prefaced with information consisting of error correction level, number of rows, number of columns, number of informative code words and the number of data characters.

Explanation of above PDF Info sample of a PDF417:

Level = 5 tells you that the error correction level is level 5. There are 13 rows and 6 columns. There are 14 info code words, and 16 characters in the data.

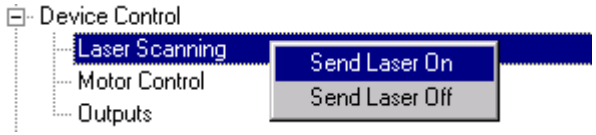
This feature can be disabled by using the exit read rate command **<J>**.

Device Control

By ESP

You can access **Device Control** from the **Utilities** menu.

For any of the **Device Control** commands, **right-click** on the command and make your selection.



By Serial Command

Enable Laser Scanning

Sending **<H>** will turn the laser on continuously.

Note: Enable Laser Scanning does not relate to **Laser On/Off** command.

Disable Laser Scanning

Sending **<I>** will turn the laser off and end the current read cycle. This feature is useful during extended periods of time when no bar code labels are being scanned or the scanner is being configured. Disabling laser scanning will not affect any downloaded commands to the scanner.

Note: Disable Laser Scanning does not relate to **Laser On/Off**, which when enabled also turns off the laser but only between read cycles.

Motor On

Sending **<KE>** turns the spinning mirror on (if not already running).

Note: the spinning mirror reaches full speed after a short time delay.

Motor Off

Sending **<KF>** turns the spinning mirror motor off. This command is useful for long idle periods.

Note: Laser turns off whenever motor is off.

Output 1
Sending **<L1>** activates the link between Output 1(+) and Output 1(–) (regardless of Master Label or Output 1 status).

Output 2
Sending **<L2>** activates the link between Output 2(+) and Output 2(–) (regardless of Master Label or Output 2 status).

Output 3
Sending **<L3>** activates the link between Output 3(+) and Output 3(–) (regardless of Master Label or Output 3 status).

Code Types Enable Commands

See also "Autodiscriminate" on page 5-28 for a discussion of **Utility** commands for **Code Types** and **Autodiscrimination**.

Default: **Code 39 (only)**
Options: **<P>** Enables most code types.
<Q> Enable Code 39 only
<R> Enable Codabar only
<S> Enable I 2/5 only

Master Label Database

See "Master Label Database" on page 7-11 for all master label commands.

Scanner Status Requests

<?> Scanner Status Byte

The scanner responds to a status request **<?>** with a two character hex value, for example **<?/22>**. To determine the status:

1. Look up the binary conversion in table 11-2.

   For example, the first **2** in binary would be **0 0 1 0** as read from binary digits 3 through 0; the second **2** the binary digits 7 through 4 which is also **0 0 1 0**.

2. Next, enter your binary values in table 11-3 in the "Binary" column next to the appropriate bit.

Table 11-3 MS-820 Scanner Status

Bit	Binary	Scanner Status
0	***0***	Command error detected
1	***1***	Command received
2	***0***	Communication error detected
3	***0***	Flash sector unprotect failure
4	***0***	Host/Aux port buffer overflow
5	***1***	Scanner is in a read cycle
6	***0***	Software Watch dog reset
7	***0***	Hardware Watch dog reset

3. Under "Binary," interpret ***1***s as true and the ***0***s as not true. For example, bit 1 has a ***1*** in the "Binary" column, indicating "Command Received." Bit 5 is also a ***1*** indicating that the "Scanner is in a read cycle."

Table 11-2 Hex Value to Binary Conversion

Hex Value	Binary Bit Digits 7	6	5	4	3	2	1	0
0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	1
2	0	0	0	0	0	0	1	0
3	0	0	0	0	0	0	1	1
4	0	0	0	0	0	1	0	0
5	0	0	0	0	0	1	0	1
6	0	0	0	0	0	1	1	0
7	0	0	0	0	0	1	1	1
8	0	0	0	1	0	0	0	0
9	0	0	0	1	0	0	0	1
A	0	0	0	1	0	0	1	0
B	0	0	0	1	0	0	1	1
C	0	0	0	1	0	1	0	0
D	0	0	0	1	0	1	0	1
E	0	0	0	1	0	1	1	0
F	0	0	0	1	0	1	1	1

<?1 > Extended Status

The scanner responds to an extended status request **<?1>** with several fields, for example: **<?/F><?1/35-338200-12,35-338201-14,476C,33,33>**.

These represent: the status byte discussed above, the boot part number (**35-338200-12**), the application part number (**35-338201-14**), the fpga part number (**5-559001-18**), flash checksum (**476C**), current RAM parameter checksum (**33**), and flash parameter checksum (**33**).

<K?> Configuration Command Status

Returns the current status of all configuration commands.

Chapter

12

Terminal Mode

Contents

Terminal Window 12-2
Macros 12-3

This section describes the terminal window and macro functions.

Terminal Window

To use the terminal mode, click on the **Terminal** button.

You will see the following window:

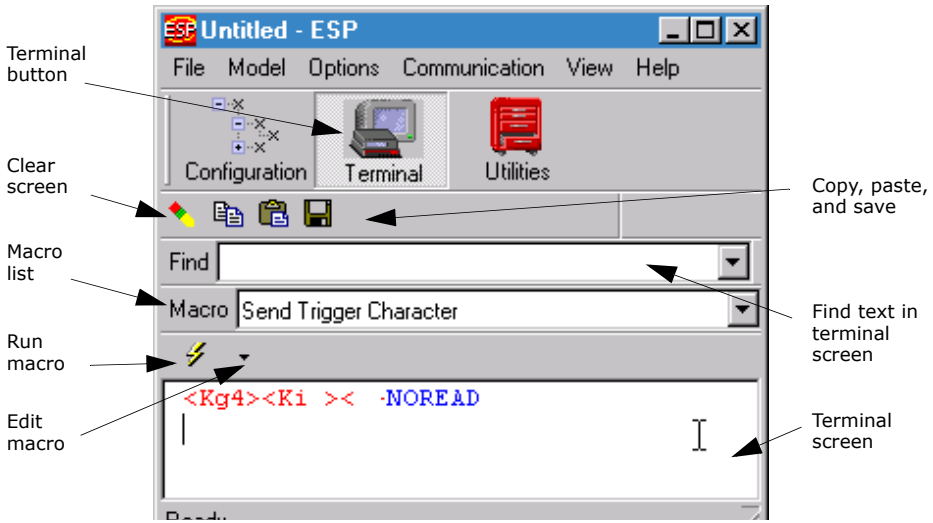


Figure 12-1 Terminal Window

The terminal screen allows you to enter serial commands (in **red**) from the macro box, by copying, or directly from your keyboard.

The terminal screen also displays bar code data or information from the scanner (in **blue**).

You can also right click in the terminal screen to bring up a handy option box.

Find Function

The Find box allows you to enter text strings to be searched for in the terminal window. For example a series of bar codes have been scanned into the terminal view and you want to determine if a particular bar code starting with ABC has been read.

1. Type **ABC** into the Find box and
2. Press the **return key**.

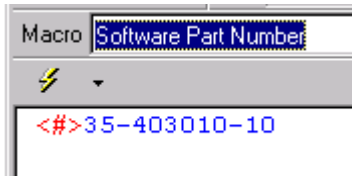
The first instance of **ABC** will be high-lighted in the terminal window.

3. Press the **return key** again for the next instance of **ABC**.

Macros

Macros can be stored in a pull down macro selection box, edited in a separate window, and executed by clicking the macro icon.

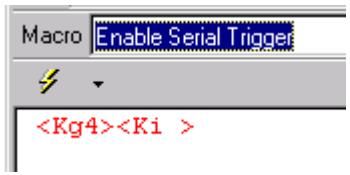
When you click on the macro icon, the current macro title displayed in the **Macro** box is copied into the terminal window. If this is a command as in the example below, the command is also sent to the scanner at the same time it is displayed.



Running a Macro

To enable a serial trigger by using a macro,

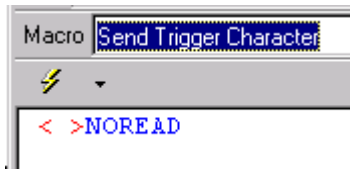
1. Click in the **Macro** pull-down box and select **Enable Serial Trigger**.
2. Click on the macro icon.



This displays the macro command in the terminal screen and sends the command to the scanner.

To send the trigger character by using a macro,

1. Click in the **Macro** pull-down box and select the **Send Trigger Character**.
2. Click on the macro icon.

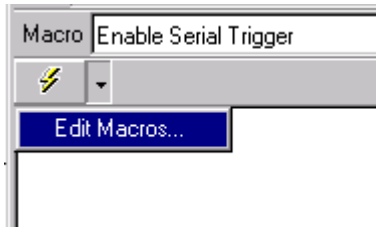


Notice the NOREAD response from the scanner.

Note: You can also send this serial command by typing **<?>** in the terminal window.

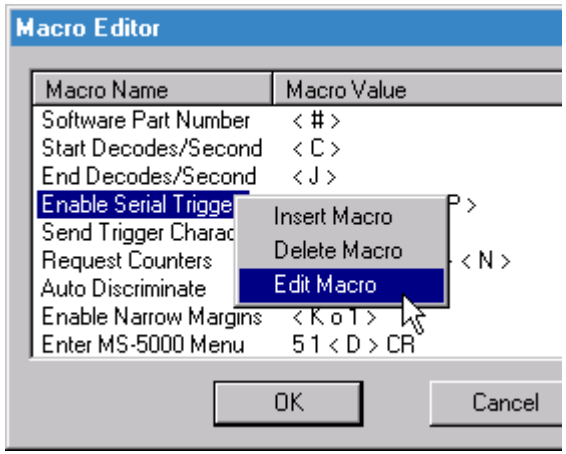
Editing a Macro

To change the **Enable Serial Trigger** macro to make **%** the new serial trigger character, do the following:



1. Click on the little **down arrow** to the right of the macro icon or **right-click** in the terminal window to bring up the following blue **Edit Macros...** box:

2. Click on the **Edit Macros...** box. This will bring up the macro editor list:

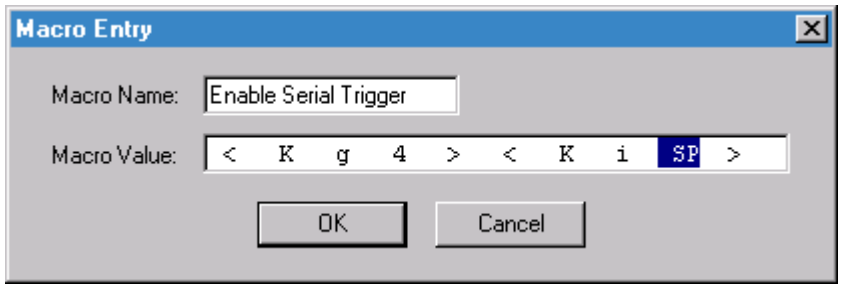


3. **Select** the macro you want to edit, in this case **Enable Serial Trigger**, and **right-click**.

   This will bring up a smaller option dialog that allows you to insert a new macro, or to delete or edit the current macro.

4. Select **Edit Macro**.

   This will display the **Macro Entry** dialog as shown below:



5. Next, select the **SP** character in the **Macro Value** line, type in a **$** character and click **OK** to update the macro.

Appendices

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Appendix A — General Specifications

Key Features

- Multiple label and symbology reading
- ESP software plus on-board menus
- Industrial IP65 rated enclosures

Mechanical

Depth: 2.59” (65.8mm)
Width: 3.47” (88.1mm)
Height: 1.38” (35.0mm)
Weight: 7.5 oz. (212g)

Environmental

Ambient Light Immunity:
450 foot candles (indoor: fluorescent, incandescent, mercury vapor, sodium vapor); 1800 foot candles (soft outdoors)

Enclosure rating: IP65

Operating temperature: 0° to 50°C

Storage Temperature: –29° to 70°C (–20° to 158°F)

Humidity: Up to 90% (non-condensing)

Emissions and Immunity

General immunity for ITE equipment:
EN 55024:98

General immunity for heavy industry:
EN 61000-6-2:98

Radiated and conducted emissions of ITE equipment: EN 55022:98, Class A

Laser Light

Semiconductor visible laser diode: 650nm nominal; 780nm nominal (optional)

Safety class:
Visible laser: CDRH Class II, 650nm
Infrared laser: CDRH Class 1, 780nm

Operating Life: 50,000 hours @25°C

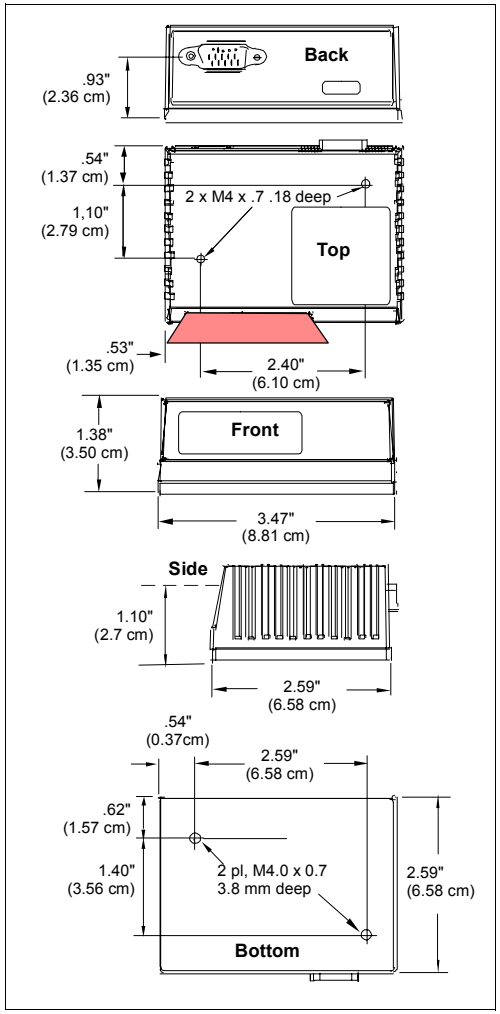


Figure A-1 MS-820 Dimensions

Appendices

Scanning Parameters

Scanning mirror type: Rotating, 10 faceted
Options: Single line/raster
Scan width angle: Typically 60°; Pitch: ±50° max.; Skew: ±40° max.
Label contrast: 25% min. absolute dark to light differential at 670nm wavelength.

Communication

RS232, RS422/485 Daisy Chain, DeviceNet and Ethernet (Modicon) can be used with an accessory IB-131 Interface

Code Types

Standard offering: Code 128, Code 39, Code 93, Codabar, Interleaved 2 of 5, UPC/EAN, PDF417
Application Standards: AIAG, UCC/EAN-128

FIS Options

FIS #	Light	Density	Line
001	Visible	Low Density	Single Line
002	Visible	High Density	Single Line
003	Visible	Low Density	Raster
004	Visible	High Density	Raster
009	Visible	Medium Density	Single Line
010	Visible	Medium Density	Raster

Beeper

Beeps on output (good read, noread, on/off).

LED Indicators

Table A-1 MS-820 Status Lights

LED	State	Status
PWR	Red On	Scanner has power
RDY	Green On	Scanner is ready to read
GD/RD	Green On	Label is qualified as good

Read Ranges

High Density

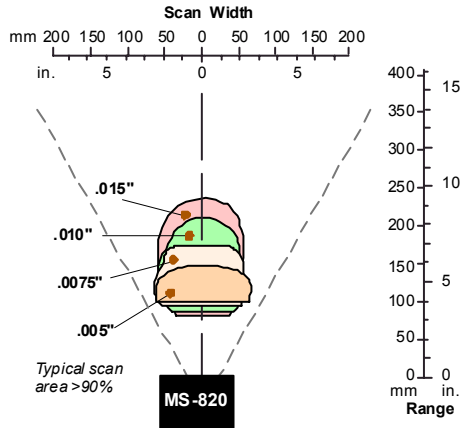


Table A-2 MS-820 High Density Range

Symbol Density[a]	Inside		Outside	
	mm	inches	mm	inches
.005" (.127mm)	102	4	140	5.5
.0075" (.191mm)	89	3.5	171	6.75
.010" (.254mm)	83	3.25	203	8
.015" (.381mm)	76	3	229	9

a. For .0033" (.884mm) symbols, call Microscan

Medium Density

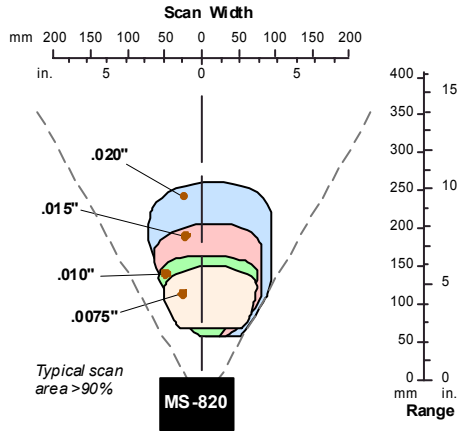


Table A-3 MS-820 Medium Density Range

Symbol Density	Inside		Outside	
	mm	inches	mm	inches
.0075" (.191mm)	64	2.5	140	5.5
.010" (.254mm)	51	2	152	6
.015" (.381mm)	51	2	191	7.5
.020" (.508mm)	51	2	254	10

Appendices

Low Density

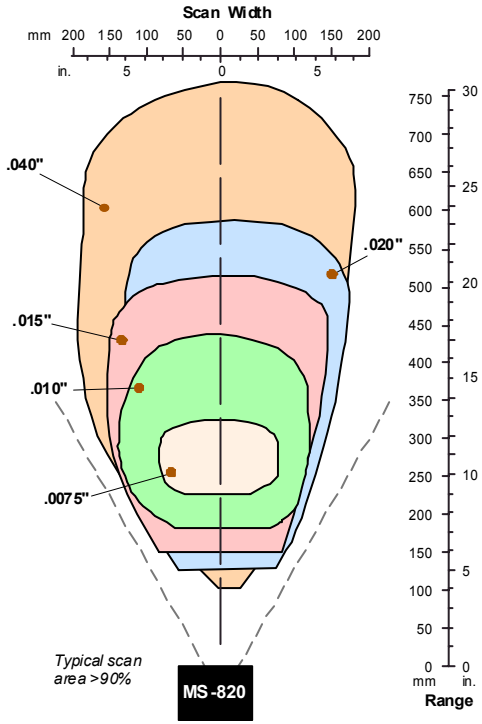


Table A-4 MS-820 Low Density Range

Symbol Density	Inside		Outside	
	mm	inches	mm	inches
.0075" (.191mm)	229	9	305	12
.010" (.254mm)	178	7	406	16
.015" (.381mm)	152	6	483	19
.020" (.508mm)	127	5	558	22
.040" (1.02mm)	102	4	762	30

Safety Certifications

FCC, CDRH, CE, UL/cUL, TüV, BSMI

Product specifications are given for typical performance at 25°C (77°F) using grade A labels. Some performance characteristics may vary at high temperatures or other environmental extremes.

© Microscan Systems, Inc. Specifications subject to change.

Appendices

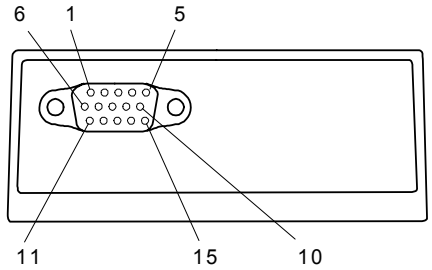
Appendix B — Electrical Specifications

Maximum Operating Power: 3.6 Watts
Cabling: Power Input: 10 to 28VDC, 200mV p-p max. ripple, 120 mA @ 24VDC (typical)
Trigger, New Master: 4.5 to 28 VDC (optoisolated)
Outputs (1,2,3): 1 to 28VDC (optoisolated) rated
(I_{CE} <100mA @24VDC, current limited by user)

Pin Assignments

Table A-5 MS-820 Host Connector, 15-pin

Pin	Host RS232	Host & Aux RS232	Host RS422/485	In/ Out
1	Power +10 to 28 VDC			In
2	TxD	TxD	TxD (–)	Out
3	RxD	RxD	RxD (–)	In
4	Power/Signal ground			
5	Trigger (–)[a]			In
6	RTS	Aux TxD	TxD (+)	Out
7	Output 1 (+)[b]			Out
8	Default configuration[c]			In
9	Trigger (+)			In
10	CTS	Aux RxD	RxD (+)	In
11	Output 3 (+)[b]			Out
12	New master pin			In
13	Chassis ground[d]			
14	Output 2 (+)[b]			Out
15	Outputs 1, 2, 3 (–)[b]			Out



Caution:

1. Be sure all cables are connected **BEFORE** applying power.
2. Always power down **BEFORE** disconnecting any cables.

a. See page A-10 for more trigger information.
b. See page A-10 for more output information.
c. The default is activated by connecting pin 8 to ground pin 4. See "By Hardware Default" on page A-22.
d. Chassis ground: used to connect chassis body to earth ground only. Not to be used as power or signal return.

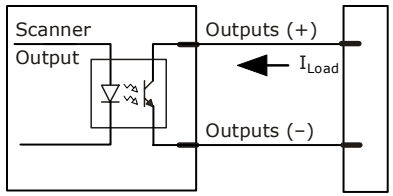
Caution: If using your own power supply, verify correct connection of power and ground lines. Incorrect connections or use of "Chassis ground," "Power ground," and "Signal ground" lines could cause equipment and/or software failure.

Optoisolator Outputs

Optoisolator circuits can transfer pulses between the scanner and peripherals with no direct connection with the scanner's internal circuitry. However, not every optoisolator configuration provides complete isolation. The following diagrams show both fully optoisolated and non-optoisolated circuits. They are only examples and do not represent all the possible wiring configurations.

Generic Output Waveform Characteristics

	I_{load}=5mA	I_{load}=50mA	I_{load}=100mA
V_{Out-On}	0.5V	0.5V	1.0V
t_{On-Typ}	5mS	0.7mS	0.8mS
$t_{Off-Typ}$	5µS	5µS	5µS

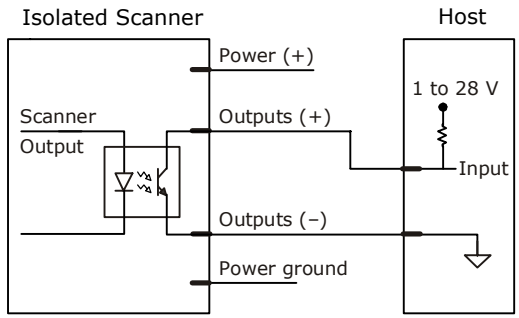


Output Circuit Examples

Fully Optoisolated

This circuit is fully optoisolated and the recommended configuration. It allows the user to apply 1 to 28 VDC to the circuit.

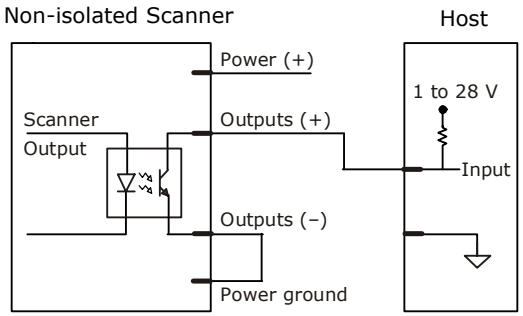
Caution: The maximum current that can pass through the optoisolator is 100 mA.



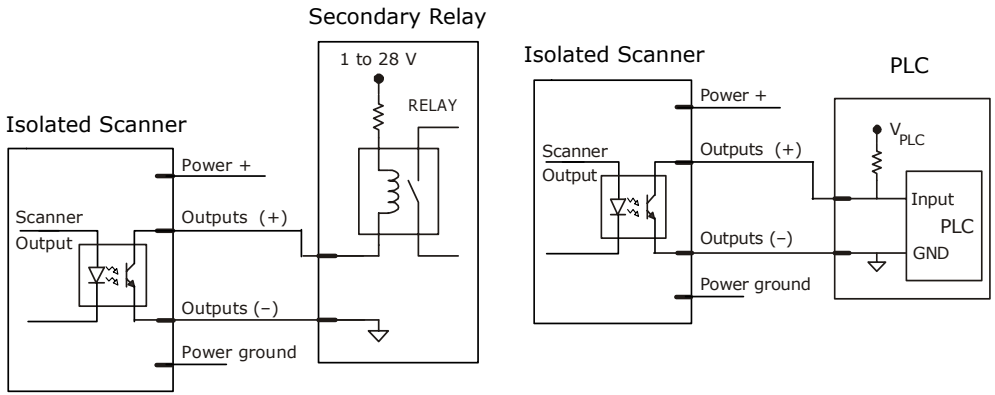
Not Optoisolated, Scanner Grounded

In this diagram, power is applied externally, but the scanner's power ground is used to complete the circuit. This setup involves some risk to the optoisolator if excessive voltages are applied.

Caution: The maximum current that can pass through the optoisolator is 100 mA.



Additional Isolated Output Circuit Examples



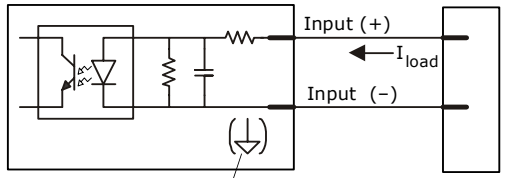
Optoisolator Inputs

All discrete inputs can be fully isolated pulses as PNP or NPN circuits. Inputs include trigger and new master.

Generic Waveform Characteristics[a]

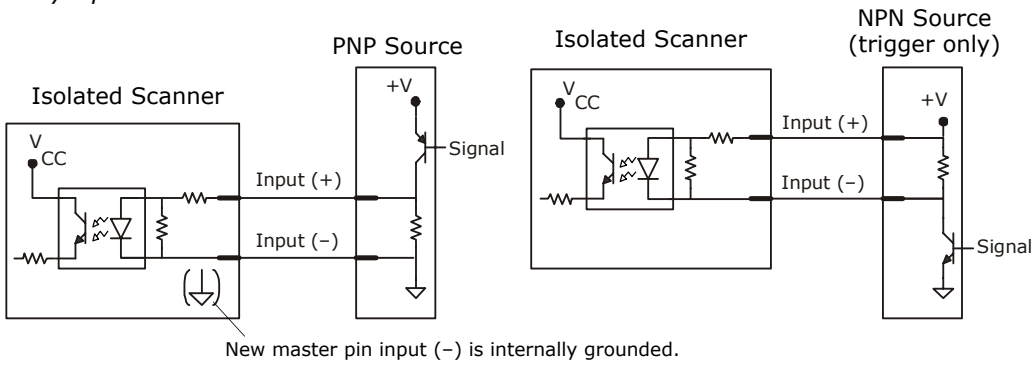
	Minimum	Maximum
$V_{IN-HIGH}/I_{IN-HIGH}$	4.5 V/3.0 mA	28 V/23 mA
V_{IN-LOW}/I_{IN-LOW}	0 V/0 mA	2.0 V/1 mA
Pulse $Width_{min}$	48 µS	

a. New Master is activated by applying a voltage of 5 to 28 VDC between New Master (+) and internal ground.

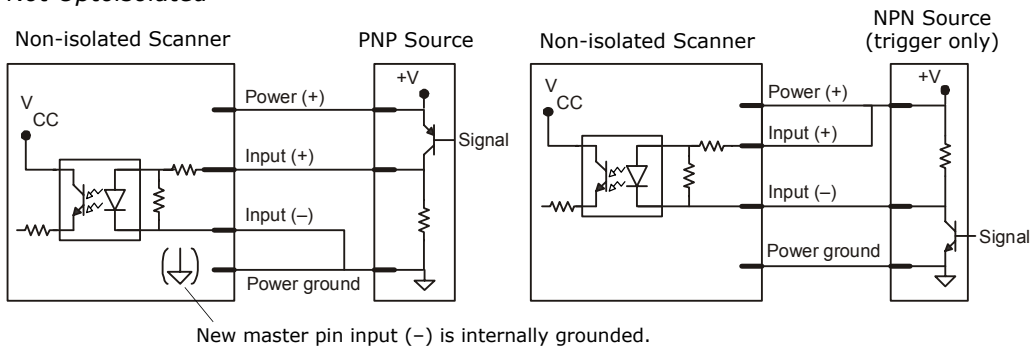


Input Examples

Fully Optoisolated



Not Optoisolated



Appendices

Appendix C — IB-131 Interface Module

The IB-131 interface module simplifies connecting to the scanner by providing separate ports for the host, power supply, trigger and network. The network port is used for multidrop or daisy chain configurations. See the following pages for configuration diagrams and a list of cables offered by Microscan for ease of connectivity when using the IB-131.

Table A-6 Host 25-pin Connector

Pin	Function
1	External ground
2	Transmit data (RS-232)
3	Receive data (RS-232)
4	RTS
5	CTS
6	Output 2 (+)
7	Signal ground
8	Output 1 (+)
9	Trigger (–)
10	Trigger (+)
11	Default configuration
13	Receive data RS-422 (+)
14	Transmit data RS-422 (–)
15	Output 3 (+)
16	Receive data RS-422 (–)
17	Output 1/2/3 (–)
19	Transmit data RS-422 (+)
25	New master/OMR (in)

Table A-7 Trigger 4-pin Connector

Pin	Function
1	Power + 10 to 28VDC (out)[a]
2	Trigger (–) (in)[b]
3	Power Ground
4	Trigger (+) (in)[a]

a. For NPN type, connect pins 1 and 4.
b. For PNP type, connect pins 2 and 3.

Table A-8 Power 3-pin Connector

Pin	Function
1	Power Ground
3	Power + 10 to 28VDC (in)

Table A-9 Scanner 15-pin Connector

Pin	Function
1	Power + 10 to 28 VDC (out)
2	Transmit RS-232/RS-422 (–)
3	Receive RS-232/RS-422 (–)
4	Power/Signal Ground
5	Trigger (–) (out)
6	RTS/Aux Transmit/RS-232/RS-422 (+)
7	Output 1 (+)
8	Default configuration
9	Trigger (+) (out)
10	CTS/Aux Receive RS-232/RS-422 (+)
11	Output 3 (+)
12	New master/OMR (out)
13	External ground
14	Output 2 (+)
15	Output 1/2/3 (–)

Table A-10 Network 25-pin Connector

Pin	Function
1	Ground
2	Aux Receive RS-232
3	Aux Transmit RS-232
6	Output 2 (+)
7	Signal ground
8	Output 3 (+)
13	Receive data/RS-422 (+)
14	Transmit data/RS-422 (–)
15	Output 3 (+)
16	Receive data/RS-422 (–)
17	Output 1/2/3 (–)
19	Transmit data (RS-422+)

Electrical:
Voltage Input: Regulated +10 to 28VDC
Cabling:
RS-232 Cable: 61-300026
Multidrop Cable: 61-100030
Daisy Chain Cable: 61-100029
Mechanical:
Length: 3.2 in. (8.13 cm)
Width: 3.15 in. (8 cm)
Height: 0.75 in. (1.9 cm)

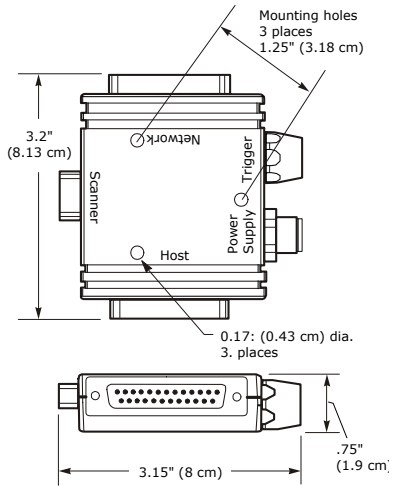


Figure A-2 IB-131 Mechanical

Scanner to IB-131

With this configuration the scanner communicates directly with the host through the IB-131.

IB-131: 99-400005-02
(1 per MS-820)

Host RS-232 Serial Cable:
61-300026 (for PC)

Power Supply: 97-10004-05 (for each scanner)

Trigger: 99-440001-10
(for each scanner)

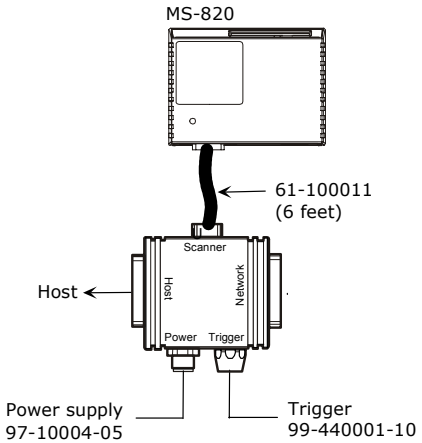


Figure A-3 Scanner/IB-131 Typical Setup

Appendices

Multidrop

This setup allows the user to link multiple scanners together, using only one host.

IB-131: 99-400005-02 (1 per MS-820)

Multidrop Cable: 61-100030 (connects multiple IB-131s)

Power Supply: 97-10004-05 (for each scanner)

Trigger: 99-440001-10 (for each scanner)

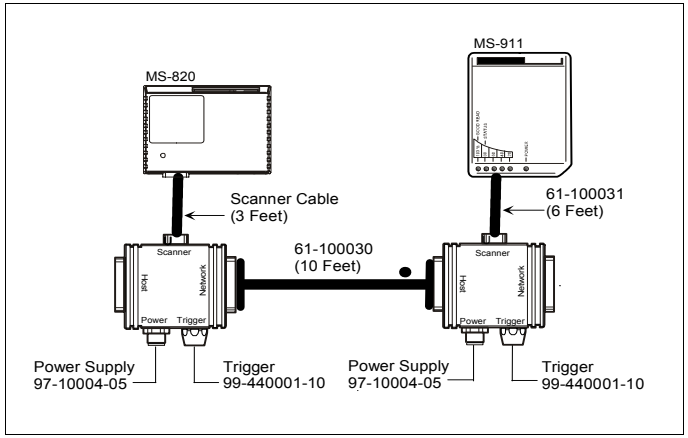


Figure A-4 IB-131 Multidrop Setup

Daisy Chain

This setup allows the user to link multiple scanners together, using only one host.

IB-131: 99-400005-02 (1 per MS-820)

Daisy Chain Cable: 61-100029 (connects multiple IB-131s)

Power Supply: 97-10004-05 (for each scanner)

Trigger: 99-440001-10 (for each scanner)

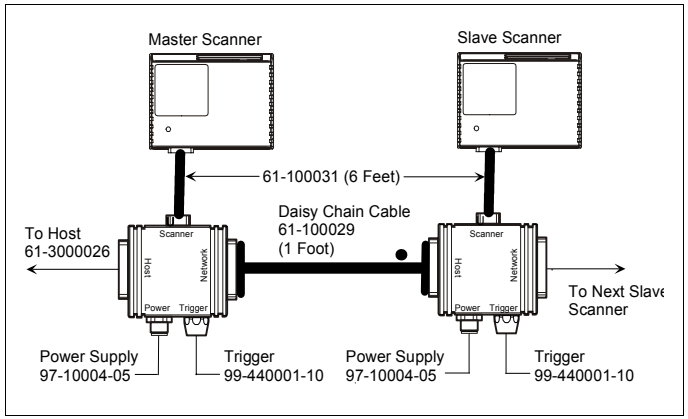


Figure A-5 Scanner/IB-131 Daisy Chain Setup

Appendices

Appendix D — Serial Configuration Commands

The following table is a list of all the available serial configuration commands in alphabetical order (also called *K commands*). These commands are also listed at the beginning of each applicable chapter. For utility (operational) commands see Table 11-1, "Summary of Utility Serial Commands," on page 11-3.

Table A-11 Complete List of Serial Configuration Commands in Alphabetical Order

Command Title	Cmd	Format
Response Timeout	**KA**	<**KA***response timeout*>
Host Port Parameters	**Ka**	<**Ka***baud rate,parity,stop bits,data bits*>
Intercharacter Delay	**KB**	<**KB***intercharacter delay*>
RS422 Mode	**Kb**	<**Kb***status*>
Laser On/Off	**KC**	<**KC***laser on/off status,laser framing status,laser off percentage ,laser on percentage*>
LRC	**Kc**	<**Kc***status*>
Gain/Sampling	**KD**	<**KD***gain,AGC mode,AGC min,AGC max*>
Preamble	**Kd**	<**Kd***status,preamble*>
Scan Speed (factory)	**KE**	<**KE***scan speed*>
Postamble	**Ke**	<**Ke***status,postamble*>
Host Protocol	**Kf**	<**Kf***protocol*>
Trigger Mode	**Kg**	<**Kg***trigger mode,trigger filter duration*>
Transition Counter	**KH**	<**KH***transition counter status,transition counter threshold*>
End of Read Cycle	**Kh**	<**Kh***end of read cycle,timeout duration*>
Serial Trigger Character	**Ki**	<**Ki***serial trigger character*>
External Trigger State	**Kj**	<**Kj***external trigger state*>
Noread Message	**Kk**	<**Kk***status,output*>
Multilabel	**KL**	<**KL***number of labels,multilabel separator*>
Bar Code Output	**Kl**	<**Kl***status,when to output*>
Master Label Database Size	**KM**	<**KM***number of master labels*>
Good Decode Reads	**Km**	<**Km***decodes before output*>
No Bar Code	**KN**	<**KN***status,message*>
Matchcode Type	**Kn**	<**Kn***type,sequential matching,match start position,match length,wild card character,sequence on noread,sequence on mismatch*>
No Object	**KO**	<**KO***status,message*>
Narrow Margins	**Ko**	<**Ko***narrow margins status*>
Scanner Type (factory)	**KP**	<**KP***density*>
Code 39	**Kp**	<**Kp***status,check digit status,check digit output,large intercharacter gap,fixed code length status,fixed code length,full ASCII*>

Appendices

Command Title	Cmd	Format
Codabar	**Kq**	<**Kq***status,start & stop match,start & stop output,large intercharacter gap,fixed code length status,fixed code length,check digit type,check digit output*>
Interleaved 2 of 5	**Kr**	<**Kr***status,check digit,check digit output,length 1,length 2*>
Serial Verification	**KS**	<**KS***serial command status,serial command beep status,control/hex output*>
UPC/EAN	**Ks**	<**Ks***UPCstatus,EAN status,supplementals status,separator status, separator character*>
Comm. Status Request	**KT?**	<**KT?**>
Code 128	**Kt**	<**Kt***status,fixed length status,fixed code length*>
UCC/EAN-128 (subset of Code 128)	**Kt**	<**Kt**,,,*UCC/EAN-128 status,output format,application record separator status,application record separator character,application record brackets,application record padding*
Scanner Setup Status Request	**KU?**	<**KU?**>
Beeper	**Ku**	<**Ku***status,volume*>
Read Cycle Status Request	**KV**	<**KV?**>
Output 1	**Kv**	<**Kv***output on,active state,pulse width,number before output*>
Code Type Status Request	**KW?**	<**KW?**>
Output 2	**Kw**	<**Kw***output on,active state,pulse width,number before output*>
Scanner Output Status Request	**KX?**	<**KX?**>
Background Color	**Kx**	<**Kx***background color*
Partial Output	**KY**	<**KY***status,start postion,length*>
Auxiliary Port Parameters	**Ky**	<**Ky***aux port mode*,baud rate,parity,stop bits,data bits, daisy chain status,daisy chain ID>
AIAG	**KZ**	<**KZ***AIAG status, ID1, status1, ID2, status2, ID3, status3, ID4, status4, *ID5a,ID5b,ID5c, status5, ID6, status6, ID7, status7, ID8, status8, ID9, status9, ID9, status10, ID11, status11, ID12, status12*>
New Master Pin	**Kz**	<**Kz***status*>
Warning Message Status	**K"**	<**K"***status1,laserhi,laserlo,novram corrupt*>
Bad Bar Code	**K'**	<**K'***status,message*>
Output 3	**K`**	<**K`***output on,active state,pulse width,number before output*>
PDF417	**K[**	<**K[***status,[unused],fixed code length status,fixed code length*>
Laser High Warning	**K;**	<**K;***message*>
Laser Low Warning	**K:**	<**K:***message*>
Code 93	**K!**	<**K!***status,fixed code length status,fixed code length*>
High Temperature Threshold	**K+**	<**K+***degrees,message*>
Low Temperature Threshold	**K-**	<**K-***degrees,message*>

Command Title	Cmd	Format
Lifetime Hours	**K$**	**<K$***hours10,message*>
Present Operating Temperature	**K%**	**<K%***deg> (read only)*
Counts	**K_**	**<K_***powerups,resets> (read only)*
Time Since Last Reset	**K@**	**<K@***hours,minutes> (read only)*
Operation Command Output	**K/**	<**K/***status*>
All Status Request	**K?**	<**K?**>

Appendix E — Serial Command Format

Serial commands are of two types: utility and configuration.

Rules that apply to both utility and configuration commands

- A less than **<** and greater than **>** characters enclose the commands.
- Commands and data are "case sensitive." That is, characters must be entered as upper or lower case, as specified.

Serial Utility Commands

These are sent during operations and are not followed by a **<A>** or **<Z>.** See Table 11-1, "Summary of Utility Serial Commands," on page 11-3.

Serial Configuration "K" Commands

These begin with a single **K** character followed by a single character, data fields, and an initializing command, as follows:

*<**K**parameterdata,data,...etc.><initializing command>*

An initializing command **<A>** or **<Z>** may follow the command. A **<Z>** initializes the scanner's memory and saves for power-on; an **<A>** initializes the scanner's memory but does not save for power-on.

For example, to enable **UPC** and save the change for power-on, send **<K*1*><Z>**.

To change **Baud Rate** and reset without saving changes for power-on, send **<Ka*3*><A>**.

Note: Allow a **1** second delay after sending the <A> command before resuming communications.

Serial Configuration Command Conventions:

- All data fields (except the last) must be followed by a comma (without a space).
- The following characters cannot be used: , < > NUL.
- All fields preceding a modified field must be included.
- If there is no change in preceding fields, then commas alone can be entered in these fields. For example, if only the last field in the following command is changing, **<Ka*4,1,0,0*>** can be entered as **<Ka*,,,0*>**.
- All fields *following* a modified field can be omitted. For example, to change **Baud Rate**, send **<Ka*3*>**.

Concatenating Configuration Commands

Commands can be concatenated (added together) in a single string or data block.

Serial Command Status Request

To ensure that any command was received and accepted, you can send the **Show Scanner Status** command: **<?>**.

The status of a specific serial command can be requested by entering the command followed by a question mark.

Entering Special Characters in Serial Commands

To enter control characters within a serial command, hold down the control key while typing the desired character.

Entering Special Characters in Embedded Menus

Control Characters

Control characters entered on the command line are displayed in the menu as mnemonic characters, such as: <CR><LF><NUL><NUL>.

Press **SP** (the space bar) once, then enter the control character by holding down the control key and simultaneously pressing the desired character. For example to define a line feed, press **SP**, then **Control** and **J** simultaneously. It is displayed as ^J on the command line and as <LF> in the menu when the screen is refreshed.

To Define a Carriage Return as a Character

Press **SP**, then **CR**. It is displayed as ^M on the command line and as <CR> in the menu when the screen is refreshed.

To Define a Space as a Character

Press **SP** twice. It is displayed as a blank space in the menu when the screen is refreshed. While it appears that nothing has been assigned, the hex value 20 will be sent during data transmission.

To Select NUL as the Character

Press **SP**, then a **0** (zero). It is displayed as <NUL> in the menu when the screen is refreshed.

Appendix F — ASCII Table

Table A-12 ASCII Table with Control Characters

Dec	Hex	Mne	Ctrl	Dec	Hex	Ch	Dec	Hex	Ch	Dec	Hex	Ch
00	00	NUL	^@	32	20	SP	64	40	@	96	60	`
01	01	SOH	^A	33	21	!	65	41	A	97	61	a
02	02	STX	^B	34	22	"	66	42	B	98	62	b
03	03	ETX	^C	35	23	#	67	43	C	99	63	c
04	04	EOT	^D	36	24	$	68	44	D	100	64	d
05	05	ENQ	^E	37	25	%	69	45	E	101	65	e
06	06	ACK	^F	38	26	&	70	46	F	102	66	f
07	07	BEL	^G	39	27	'	71	47	G	103	67	g
08	08	BS	^H	40	28	(	72	48	H	104	68	h
09	09	HT	^I	41	29	)	73	49	I	105	69	i
10	0A	LF	^J	42	2A	*	74	4A	J	106	6A	j
11	0B	VT	^K	43	2B	+	75	4B	K	107	6B	k
12	0C	FF	^L	44	2C	,	76	4C	L	108	6C	l
13	0D	CR	^M	45	2D	-	77	4D	M	109	6D	m
14	0E	SO	^N	46	2E	.	78	4E	N	110	6E	n
15	0F	SI	^O	47	2F	/	79	4F	O	111	6F	o
16	10	DLE	^P	48	30	0	80	50	P	112	70	p
17	11	DC1	^Q	49	31	1	81	51	Q	113	71	q
18	12	DC2	^R	50	32	2	82	52	R	114	72	r
19	13	DC3	^S	51	33	3	83	53	S	115	73	s
20	14	DC4	^T	52	34	4	84	54	T	116	74	t
21	15	NAK	^U	53	35	5	85	55	U	117	75	u
22	16	SYN	^V	54	36	6	86	56	V	118	76	v
23	17	ETB	^W	55	37	7	87	57	W	119	77	w
24	18	CAN	^X	56	38	8	88	58	X	120	78	x
25	19	EM	^Y	57	39	9	89	59	Y	121	79	y
26	1A	SUB	^Z	58	3A	:	90	5A	Z	122	7A	z
27	1B	ESC	^[	59	3B	;	91	5B	[	123	7B	{
28	1C	FS	^\	60	3C	<	92	5C	\	124	7C	|
29	1D	GS	^]	61	3D	=	93	5D	]	125	7D	}
30	1E	RS	^^	62	3E	>	94	5E	^	126	7E	~
31	1F	US	^_	63	3F	?	95	5F	_	127	7F	D

Table A-13 Communication Protocol Commands

Protocol Command (Mnemonic displayed on Microscan menu)	*Control Characters (Entered in menu or serial command)*	*Hex Code*	*Effect of Command*
RES	*^D*	*04*	*Reset*
REQ	*^E*	*05*	*Request*
EOT	*^D*	*04*	*Reset*
STX	*^B*	*02*	*Start of Text*
ETX	*^C*	*03*	*End of Text*
ACK	*^F*	*06*	*Acknowledge*
NAK	*^U*	*15*	*Negative Acknowledge*
XON	*^Q*	*11*	*Begin Transmission*
XOFF	*^S*	*13*	*Stop Transmission*

Appendix G — Embedded Menus

In addition to **ESP-MP**, you can also use a communications menu such as Microsoft's HyperTerminal™ to establish communication with Microscan's embedded menus.[1]

1. With your host connected to the configuration port, set your host communications settings as follows: **9600**, **7**, **1**, and **Even**.
2. Set **Flow Control** to **None**.
3. Make the communications port selection. (Usually **COM 1** or **COM 2** for desktops and **COM 1** for laptops.)
4. Upon connection, send a **<D>** command to bring up the main menu.

```
                          MICROSCAN SYSTEMS, INC.
                           CONFIGURATION PROGRAM
                                MAIN MENU
                              35-338201-14
--------------------------------------------------------------------------------

   TOPICS                          DESCRIPTIONS

1) COMMUNICATIONS                  HOST PROTOCOL AND HOST PORT.
2) OPERATIONS                      TRIGGERING, TIMEOUTS, ETC.
3) CODE TYPES 1                    CODE 39, PDF417, I 2 OF 5, UPC, CODE 128.
4) CODE TYPES 2                    CODE 93, CODABAR, ETC.
5) GLOBAL CODE PARAMETERS          MARGINS, SYMB.ID., BACKGROUND, AIAG, ETC.
6) SCANNER OUTPUT                  BARCODE,BEEPER,RELAYS,OUTPUT MODES, ETC.
7) SCANNER SETUP                   GAIN,SCAN SPEED,TRANSITION COUNT,ETC.
8) DIAGNOSTICS SETUP               WARNING MESSAGES, OPERATION TIME, ETC.


--------------------------------------------------------------------------------
            ESC = MAIN MENU OR EXIT    N  = NEXT ITEM
            M   = PREVIOUS MENU        SP = NEXT ITEM
            B   = PREVIOUS ITEM        CR = THIS ITEM
--------------------------------------------------------------------------------
MAIN--> COMMUNICATIONS
```

Menu navigation commands are case sensitive. Use the space bar or N to advance to the next item, CR (return key) to select a highlighted item, B to return to the previous item, M to return to the previous menu, and ESC to return to the Main menu or to exit the program. When exiting the program, you will be prompted to save your active settings for power up (Y or N). Typing Y will be equivalent to saving with a <Z> command.

1. If you are using Microsoft's HyperTerminal program, you may find that the initial screen is unviewable when you call up the program with the **<D>** command. If this occurs, simply exit the embedded menu with a **ESC**, **E**, and **N** sequence and repeat the **<D>** command.

Appendix H — Defaulting/Saving/Initializing

Defaults are original or saved settings. Defaulting occurs when default settings (from flash or user-saved NOVRAM) are restored. Defaulting might be necessary if you have make temporary changes, communications between the scanner and another device are lost or interrupted, or you are using incompatible equipment (for example, a terminal that is set at 9600 baud communicating with a scanner that is set at 38.4K baud).

Initializing occurs whenever any command or set of commands is implemented.

Active Memory (SRAM) is where the scanner's active settings are stored during use. These are not available on power-up.

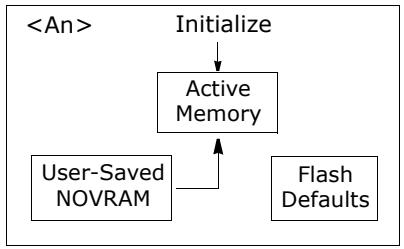
User-saved NOVRAM *(non-volatile random access memory)* is where the scanner's operating parameters are stored for power-on. It can be changed by user command.

Flash Defaults are where the scanner's default application/boot programs are stored. It can only be changed by changing the application/boot codes.[1]

Defaulting

Restore User-saved NOVRAM Defaults to Active Memory

- Restores user-defined NOVRAM settings to active memory.
- Initializes serial configuration commands in active memory and resets counters to zero.



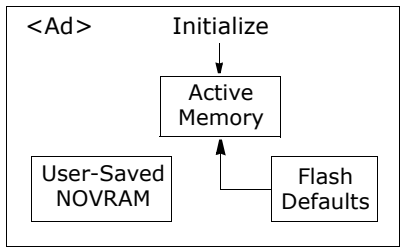
By Serial Command

Send **<An>** command to the scanner.

By ESP (There is no equivalent ESP command.)

Restore Flash Defaults to Active Memory

- Restores flash defaults to memory.
- Initializes serial configuration commands in active memory and resets counters to zero.
- Does not save settings to NOVRAM for power-on.



By Serial Command

Send **<Ad>** command to the scanner.

By ESP

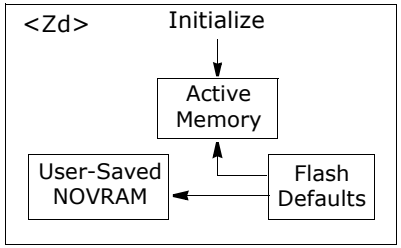
1. **Right-click** in the configuration window and select **Default All ESP Settings.**
2. **Right-click** and select **Save to Scanner, Send No Save**.

1. See your Microscan sales representative to access the latest application codes.

Restore Flash Defaults to Active Memory and for Power-on

Caution: Defaulting the scanner to flash default settings will overwrite user-saved NOVRAM settings.

- Restores flash defaults to memory.
- Restores flash defaults to user-saved NOVRAM for power-on.
- Initializes serial configuration commands in active memory and resets counters to zero.



By Serial Command

Send **<Zd>** command to the scanner.

By ESP

1. **Right-click** in the configuration window and select **Default All ESP Settings**.
2. **Right-click** and select **Save to Scanner, Send and Save**.

By Hardware Default

If a software default reset is not possible, it may be necessary to reset the scanner by shorting (connecting) specific pins. This procedure has the same effect as the <Zd> software command.

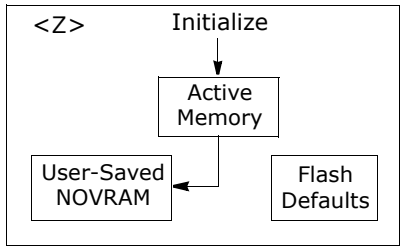
1. Apply power to the scanner.
2. If using an IB-131, locate pins 7 and 11 on the host connector (see Table A-5 on page A-6).

   Caution: Be certain that the correct pins are located. Connecting the wrong pins could cause serious damage to the unit.
3. Momentarily connect these wires (or pins) and listen for a series of short beeps.
4. Within 3 seconds, connect them again. A longer beep should be heard. If not, repeat the process.

Saving

Save Active Settings except Factory for Power-on

- Initializes serial configuration commands in active memory and resets counters to zero.
- Saves all active settings except factory settings to NOVRAM for power-on.



By Software Command

Send **<Z>** command to the scanner.

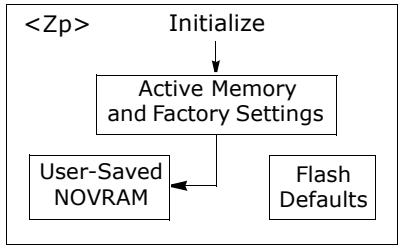
By ESP

Right-click in the configuration window and select **Save to Scanner, Send and Save**.

Note: Allow a **1** second delay after sending the <Z> command before resuming.

Save Active Settings including Factory for Power-on

- Initializes serial configuration commands in active memory and resets counters to zero.
- Saves all active settings including factory settings to NOVRAM for power-on (factory settings include but are not limited to Focus, Gain, Tracking, and Scan Speed).



By Serial Command

Send **<Zp>** command to the scanner.

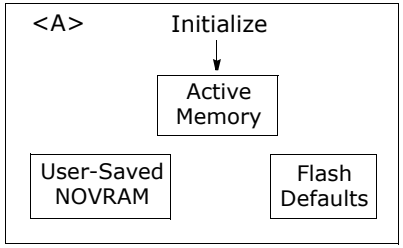
By ESP

Right-click in the configuration window and select **Advanced, Send and Save, Including Factory**.

Initializing

Initializing is a part of all save and default functions. It is also used as a follow-on to implement serial configuration commands into active memory.

- Initializes serial configuration commands in active memory and resets counters to zero.
- Does not save settings to NOVRAM.



By Serial Command

Send **<A>** after a serial configuration command or a string of serial configuration commands, for example, **<Kd1><A>**.

By ESP

Right-click in the configuration window and select **Save to Scanner, Send No Save.**

This will initialize all serial configuration changes that have been made in the current ESP session.

Note: Allow a **1** second delay after sending the <A> command before resuming communications.

Loss of Communications

Making changes to communications with the host such as **Baud Rate, Parity, Stop Bits, LRC**, etc. without corresponding changes in linked device(s) can result in the loss of menu access through If this should occur, you should restore the scanner's defaults.

Appendix I — Position Scanner and Bar Code

In positioning the scanner in relation to the bar codes being scanner, consider the following:

- Position the scanner in a place devoid of sunlight, bright lights, or laser light from other sources.
- Avoid excessive tilt, skew, or pitch. Maximum tilt is determined by label characteristics and the number of decodes required. Maximum skew is **±40°**; maximum pitch is **±50°**.[1]
- Pitch or skew label or scanner a minimum of ±15° to avoid specular reflection, the return of direct, non-diffused light.[2]

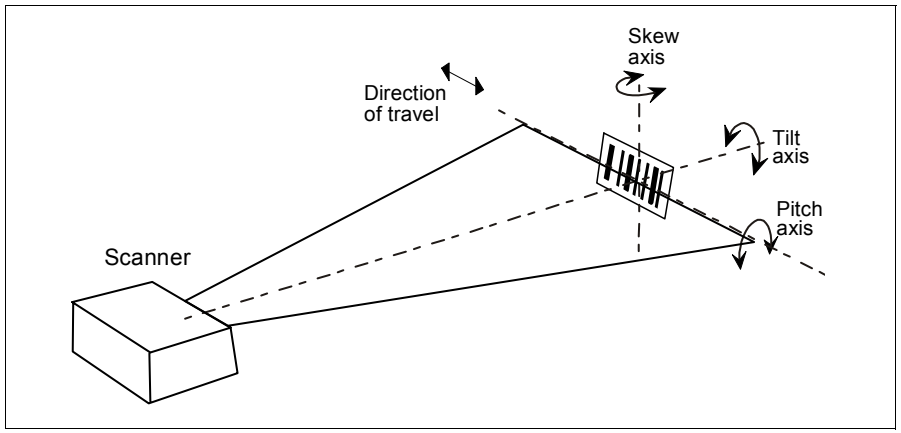


Figure A-6 Scanner/Symbol Position

1. Maximum tilt is determined by label characteristics and number of decodes required.
2. The specular reflection zone is a narrow zone straight out from the scanner in which direct reflected light from a label can distort the scanner's ability to distinguish bars from spaces.

Appendix J — Position Object Detector

In a typical operation, a scanner will wait for bar code data only during a triggered read cycle. A read cycle is initiated by a "trigger" and can be in the form of a serial command from the host (internal trigger) or a signal from an object detector (external trigger).

When an object detector (also called a sensor, package detector, etc.) is used, it is set up so that its beam will bounce off the approaching object and the resulting pulse will be sent to the scanner to begin the read cycle. Typically, a detector is positioned so that it will detect the presence of an object before its label can be scanned.

An object detector is mounted in almost any position relative to the object as long as (1) the object passes within range of the detector and (2) direct or reflected light from the detector does not interfere with the scanner's reception.

As the item continues to move down the line, its label moves into the scanner beam and is read by the scanner.

The drawing below shows a label in the picket fence direction with the object detector positioned so as not to cause interference.

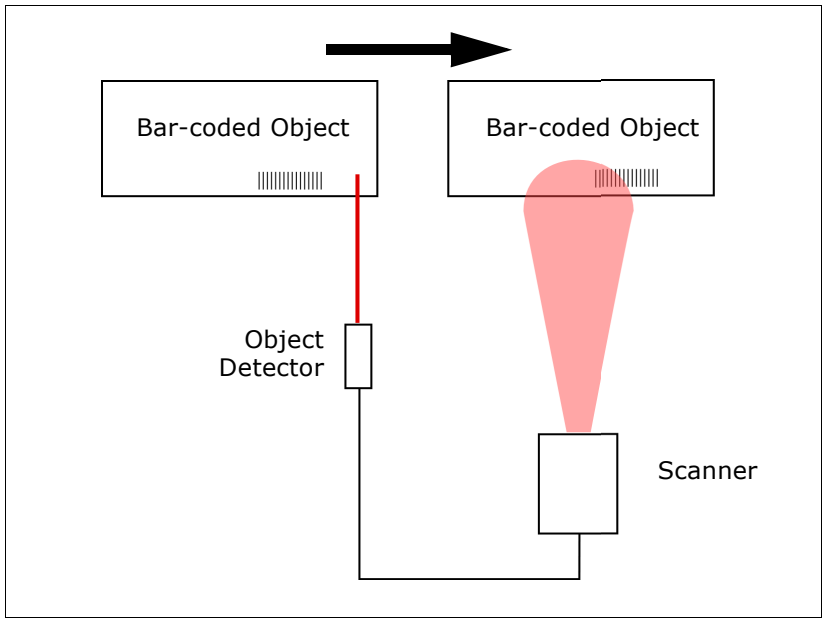


Figure A-7 Object Detector

Appendix K — Test Decode Rate

By Bar Code Label Configuration

You can enter the read rate test by scanning the following bar codes:

Scan this symbol to enable bar code configuration:.

(This will also activate the read performance LED's on the scanner.)

To enable all bar code symbologies, scan the following:

Scan this symbol to start your read rate test:

You should now be able to read any enabled bar code.

To end the read rate test and the bar code configuration program, scan the following symbol:

This will terminate label configuration mode. Changes made in configuration will of course remain in effect just as would changes made in the menus or by serial commands.

By Serial Command

1. Position a stationary bar code in front of a functioning scanner at the scan distance used in your application.
2. Set for single scan line scanning (**Top Offset** setting equal to **Bottom Offset**).
3. Enter a **<C>** command to see the decodes per second.

   The decode rate is the number of decoded scans per total number of scan. It will appear at the beginning of the data strings.

   Note: You can also enter a **<Cp>** command to see the percentage of decodes per scans.
4. Make a note of the decode rate. You will need this when calculating the number of decodes (see "Formulas for Number of Decodes" on page A-29).
5. End the test by sending the **<J>** command.

By ESP

See "Read Rate" on page 11-10.

Testing with a Moving Label

Before testing with a moving label, it is highly recommended that you calculate the expected number of decodes by using the formulas in "Formulas for Number of Decodes" on page A-29.

Once you've mounted the scanner, established a good read rate with a stationary label, and calculated the number of decodes for your label speed, you can begin decoding with moving labels.

Number of Decodes

To ensure reliable scanning, you need to apply a minimum of five decodes to each bar code. This means that all variables, label speed, read range, etc. are significant.

Note: Variations between labels are common. For this reason, the greater number of sample bar codes tested, the more likely you are to achieve optimum decode rates.

In general, the number of decodes of a given bar code can be increased by:

- Increasing label height
- Decreasing label length
- Increasing scan rate (spinning mirror speed)
- Slowing label speed

Appendix L — Formulas for Number of Decodes

To ensure reliable scanning, apply a minimum of *five* decodes to each bar code. Use the formulas below to calculate the number of decodes that your label will receive.

If the number of decodes you derive from one of these calculations is less than the minimum for your application, plug in the minimum number of decodes (5) and solve for another parameter that might be changed, such as label speed or scans per second.

Note: While the formulas given here solve for the predicted number of decodes, you may also use the formulas to solve for other parameters that might be changed, such as label speed, label length, etc.

Single Line Ladder Calculation

For single scan line ladder scanning, use the following formula:

$$\left(\frac{LH}{LS} \times DR\right) - 3 = NS \text{ (number of decodes)}$$ [1]

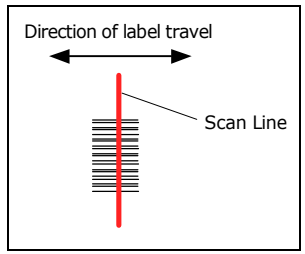


Figure A-8 Ladder

LH (Label Height) (ladder formula only) is a measurement of the height of individual bars.

***LS** (Label Speed) is the distance per second that a bar code moves through the scan.*

***DR** (Decode Rate) is the number of decodes per second that a given bar code receives (as derived from a stationary scan test in "Test Decode Rate" on page A-27).*

Example:

LH = 1 inch
LS = 100 inches per second
DR = 900 scans per second

$$ND = \left(\frac{1}{100} \times 900\right) - 3 = 6 \text{ complete decodes}$$

1. The -3 component in the formula is included to allow for AGC acquisition, an incomplete first scan, and an incomplete last scan. This applies only if the number inside the parentheses equals 4 or more. If the number equals 3, then only subtract 2 to derive 1 good scan.

Single Scan Line Picket Fence Calculation

For single scan line picket fence scanning use the following formula:

$$\left(\frac{(SW - LL)}{LS} \times DR\right) - 3 = \text{number of complete decodes} \quad [1]$$

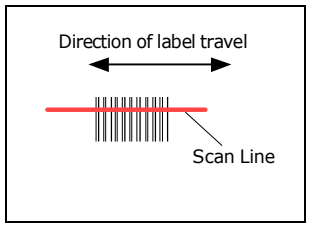


Figure A-9 Picket Fence

Example:

LL = 2 inches (including quiet zones)

LS = 100 inches per second

SW = 4 inches

DR = 1000 decodes per second

$$\left(\frac{(4 - 2)}{100} \times 1000\right) - 3 = 17 \text{ complete decodes}$$

Angled Picket Fence Calculation

The number of complete scans for angled picket fence is calculated the same as that for picket fence, with the exception that the scan width is shortened in proportion to scan tilt.

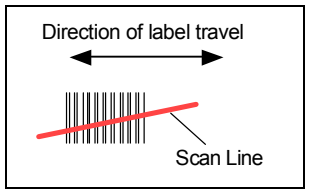


Figure A-10 Angled Picket Fence

Improving the Number of Decodes

After changing any of the parameters described in this section, recalculate the number of decodes.

Scan Rate

Scan rate is a function of motor speed and is adjustable. A slower scan rate may allow greater label range and/or higher decode rates, but at the cost of fewer scans per label.

Range

Adjusting the label's range, if possible, is one of the quickest and most effective ways to improve decode rates. However, in some applications you may need to select a less than optimum range, or one that is beyond the fringes of the ranges.

Scan Width

Increasing scan width will increase the number of scans in a picket fence oriented application. Scan width is linked with scan range and changing one will usually require a change in the other.

Label Speed

Applies to both picket fence and ladder oriented labels. If your application allows it, slowing label speed (the time in seconds that a label is fully within the scan width of the scanner) is an effective way to increase the number of decodes.

Label Dimensions, Label Density, and Label Ratio

Not usually an option in most applications, but changes to label parameters can affect number of decodes calculations and possibly decode rates.

If your application allows it, shortening the length of a picket fence label means the label will be in the scan range longer and hence receive a greater number of scans. Increasing the height of a ladder label means it will receive more scans. Changing label density and/or bar code ratio is another way ranges, decode rates, etc. can be altered.

Gain and Tracking

These adjustments, typically made by qualified technicians, are referenced in the Scanner Setup menu (see "Defaulting/Saving/Initializing" on page A-21). Changes to tracking will generally have a limited affect on decode rates.

Appendix M — Operational Tips

Do:

- Check inputs (label speed, length, height, etc.) to ensure the desired number of decodes per label.
- For optimum decodes, mount scanner so that your labels pass through the center of the depth-of-field (minimum/maximum range). You find the center by moving your label in and out during a read rate test.
- Avoid excessive tilt, pitch, and skew of the bar code label.
- Check the bar code label for readability by doing a decode rate test. If there is any question about the label's readability, contact your Microscan representative at ***helpdesk@microscan.com***.
- After changing any parameter that might affect decode rate, repeat decode rate test.
- Clean the scanner window with a clean, dry Q-tip or cotton cloth on a regular basis.

Do Not:

- Aim the scanner into direct light or sunlight.
- Aim the scanner into an external object detector or other light-emitting device.
- Obstruct the scanner window with mounting hardware or other objects.
- Connect chassis of scanner and host to different ground potentials.
- Operate the scanner in excessive temperature environments.

Appendix N — Interface Standards

Interface Standards, established by the Electronic Industries Association (EIA), specify such things as the signaling voltage levels, maximum cable lengths, and number of drivers. With Microscan devices, selection of interface is made by pin assignment and, in the case of the host communications, by software switching between RS232 and RS422. Microscan devices use RS232, RS422, and RS485 multidrop.

RS232

RS232 defines an interface between two devices such as, for example, the scanner and host. It differs from the other interfaces by dedicating individual pins to specific functions and by requiring both devices to share a common ground line. Since both device chassis are connected to a common ground, a ground loop potential and the possibility of noise interference exists. Therefore cable lengths are limited to a maximum of 50 feet (19.7m). Despite being the most limited, this interface is used frequently because of the large installed base of RS232 equipment.

RS422

RS422, unlike RS232, measures signals deferentially; that is, the receiver looks at the potentials between the two receive (or transmit) wires rather than the potential between signal and ground. As a result, cables, if shielded, can be up to 4000 feet (1219m) in length. Like RS232, RS422 communication is designed for only two devices on a single line and must have a common ground. It can be used wherever RS232 is used.

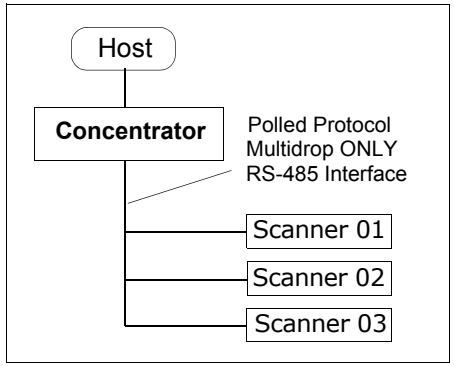
RS485

RS485, like RS422, can transmit up to 4000 feet (1219 m) using differential voltages but unlike RS422, its transmitters are turned off until a request for data is received from the host. RS485 is used exclusively in multidrop protocol.

Appendix O — Multidrop Communications

This appendix describes the rules for setting up a concentrator or controller to communicate with a scanner in standard Multidrop protocol.

The diagram to the right shows a typical Multidrop network in which 1 to 50 scanners can communicate with a host via an intermediary device, a concentrator or a controller.



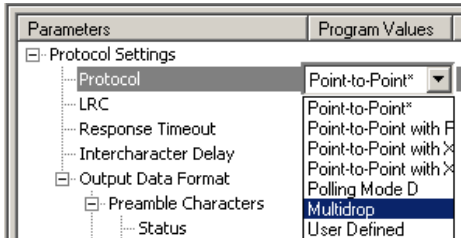
Configure Your Scanner for Multidrop

1. With the scanner connected to the host, do **Retrieve Scanner Settings** as in Step 5 —"Retrieve Scanner Settings" on page 2-6.
2. Select **Multidrop** in the **Protocol** configuration menu.

   You will see the following message:

   Important. You must change your preamble and postamble characters so that they are not CR or NULL.

   This allows data to move through the concentrator without interference.



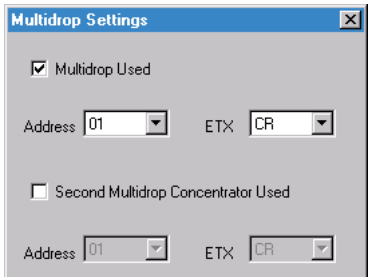
3. Click **OK**.
4. Next, go to **Preamble Characters** (still in the **Protocol** menu) and double-click on **Characters**.
5. This will open up an ASCII character table. Select any character other than **CR**. For example, select **LF**.
6. Repeat the above for **Postamble**.
7. Check the multidrop address. Enter a number from **01** to **50**.
8. Right-click in the window and select **Save to Scanner** and **Send and Save**.
9. Your scanner is now in multidrop. From here on, you will need to use the concentrator to relay commands and data between the scanner or scanners and the host.
10. Next, go to "Connect to Scanner via the Concentrator" on page A-35.

Appendices

Connect to Scanner via the Concentrator

You will need a multidrop concentrator and the required power supplies and cabling to communicate with your scanner(s).

1. From the **Communications** drop down menu, select **Configure Multidrop** to bring up the **Multidrop Settings** dialog.



2. If necessary, change the default address to match the address of your multidropped scanner and click **OK**.

   If the host serial port is not connected in ESP, you will see the following popup message:

   ESP is not currently connected to the multidrop concentrator. Do you wish to establish a connection now?

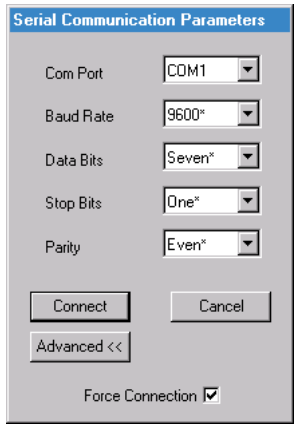
3. Click **Yes**.

   You will see a **Serial Communication Parameters** dialog as shown on the next page.

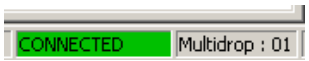
   Notice that the **Force Connection** option is checked. Do not change this.

4. Select the concentrator's host port communications settings.

   When you click **Connect**, you will be connecting to your concentrator, which can then relay commands to the scanner whose address was set in the **Multidrop Settings** dialog.



5. Click **Connect**.
6. You should see the **CONNECTED** message in green at the bottom of the window along with the scanner's **Multidrop** address.



7. Do **Retrieve Scanner Settings** to upload scanner's configuration. If upload fails, return to the **Serial Communication Parameters** dialog and make the corrections.
8. Follow the same procedure for connecting other scanners to your multidrop network.

Note: For more information, see your scanner user's manual or Microscan's ***MS-5000 Multidrop Concentrator User's Manual*, *83-005000*.**

Appendices

Polling Sequence

Data that is transmitted to the host (bar code data, noread messages, counters, etc.) via concentrators is solicited by poll requests from the host.

The polling sequence example by poll address 1E (ASCII hex value for Scanner 02) and a REQ (request). The scanner responds by first transmitting its own address, 1E, followed by a STX (start of text) character, and then the data. Next it transmits an ETX (end of text) character and an LRC (longitudinal redundancy check) character.

If the concentrator (or controller) receives the data from the scanner and is able to validate it with an LRC calculation, it responds with an ACK (acknowledgment). If the scanner in turn receives the ACK, the scanner ends this exchange with a RES (reset).

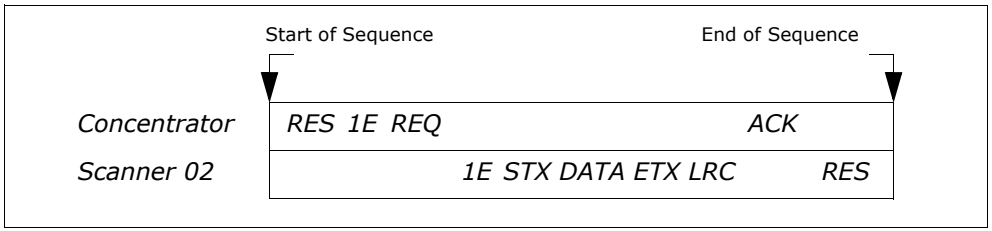


Figure A-11 Polling Sequence

Polling Reset

- If the scanner has no information, it responds to a poll request by transmitting a RES (reset).
- If the scanner receives a NAK instead of the ACK after transmitting its data string, it will re-attempt to send the data string up to three times. If the scanner still does not receive an ACK, it will send a RES (reset) and discard the data in its buffers.
- If the scanner transmits data to the concentrator and the concentrator responds with an ACK or NAK, but the scanner doesn't receive the concentrator's response, the scanner will timeout and send a REQ to the concentrator and request another response. If after three retries (the number of times it transmits a REQ to the concentrator) the scanner receives no response, it ends the transmission with a RES (reset).

Select Sequence

Unlike poll requests, select commands always originate from the host and consist of serial configuration or operation commands to devices that are configured in Multidrop. The scanner complies with the command when it is polled during the cycle.

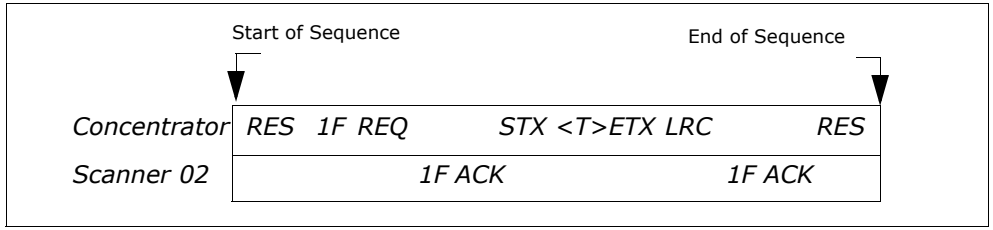


Figure A-12 Polling Sequence

A RES (reset) is the first command in the select sequence. The 1F hex is the select address associated with Scanner 02 address. It is followed by a REQ (request). The scanner responds with its own select address, 1F hex, and an ACK (acknowledge). The concentrator then transmits an STX (start of text), the data (in this case a <T>), an ETX (end of text), and an LRC character.

The scanner replies by transmitting its own address, followed by an ACK, acknowledging receipt of the command. Upon receipt of an ACK, the concentrator concludes the successful exchange with a RES.

In the example above, the scanner only acknowledges a trigger counter request from the concentrator. It does not respond to the trigger counter request until a subsequent poll. For example, if the scanner's trigger count was 12 at the time the trigger counter request was received, on a subsequent poll it would send 02T/00012. (The 02 at the beginning of the string is the scanner's address.)

Select Reset

If the scanner receives bad data from the concentrator, it transmits a SEL (its select address) and a NAK to the concentrator. The concentrator re-transmits the data up to three times. The concentrator will end the sequence with a RES (reset) if no ACK is received.

Table A-14 Multidrop Addresses

Multidrop Address	Poll Character		Select Character	
	ASCII	HEX	ASCII	HEX
01	^\	1C	^]	1D
02	^^	1E	^-	1F
03	SP	20	!	21
04	"	22	#	23
05	$	24	%	25
06	&	26	'	27
07	(	28	)	29
08	*	2A	+	2B
09	,	2C	-	2D
10	.	2E	/	2F
11	0	30	1	31
12	2	32	3	33
13	4	34	5	35
14	6	36	7	37
15	8	38	9	39
16	:	3A	;	3B
17	<	3C	=	3D
18	>	3E	?	3F
19	@	40	A	41
20	B	42	C	43
21	D	44	E	45
22	F	46	G	47
23	H	48	I	49
24	J	4A	K	4B
25	L	4C	M	4D

Multidrop Address	Poll Character		Select Character	
	ASCII	HEX	ASCII	HEX
26	N	4E	O	4F
27	P	50	Q	51
28	R	52	S	53
29	T	54	U	55
30	V	56	W	57
31	X	58	Y	59
32	Z	5A	[	5B
33	\	5C	]	5D
34	^	5E	_	5F
35	`	60	a	61
36	b	62	c	63
37	d	64	e	65
38	f	66	g	67
39	h	68	i	69
40	j	6A	k	6B
41	l	6C	m	6D
42	n	6E	o	6F
43	p	70	q	71
44	r	72	s	73
45	t	74	u	75
46	v	76	w	77
47	x	78	y	79
48	z	7A	{	7B
49	|	7C	}	7D
50	~	7E	D	7F

Appendix P — Glossary of Terms

Active On (I_{ON}). An optoisolated input that's logically "on" when current flows through the connection points.

Active Off (I_{OFF}). An optoisolated input that's logically "on" when *no* current flows through the connection points.

Analog Gain Adjustment (AGC). Adjustment to signal strength that seeks to maintain a constant level regardless of the range of the symbol.

Application Record. A variation of UCC/EAN-128 which adds an application identifier to label data, including user-definable separators, brackets, and padding.

Autocalibration. A routine that cycles through various optical settings and selects the combination that produce the best read rate.

Autodiscriminate. The ability to decode several different symbologies without changing configuration.

Auto Range. Outward focus of the scanner until an object is sensed by signal strength. The scanner then begins searching for a decodable label.

Auxiliary Port. RS232 connections to an auxiliary terminal or device for remote viewing. the transfer of data to and from the host, and under certain conditions a configuration port.

Bar Code. The symbol used for recognition by a bar code scanner. An array of parallel bars and spaces of varying widths that conform to recognized standards and can be decoded and displayed as serial data.

Bar Code Data. The information that is transmitted from a decoded bar code symbol.

Bar Code Label. The physical media on which a bar code symbol is presented.

Bar Code Density. Symbol size as measured by the narrow bar width.

Baud Rate. The number of discrete signal events per second. Bits per second.

Capture. The act of grabbing or recording a frame by an sensor. A frame or succession of frames that are captured.

Channel. A high-speed pathway between the computer and the control units of the peripheral devices.

Check Digit. A Modulus 43 or Modulus 10 digit that is added to the symbol message for additional data integrity.

Configuration. A setup or process of changing a scanner's settings to conform to a specific application. A physical arrangement of components.

Concentrator. Intermediary device that relays data from scanners to a host and commands from the host to the scanner or other devices.

Connector. Physical device (plug or socket) on a device or cable to provide in/out connectivity for various circuits and pins.

Counter. Memory space provided to keep track of scanner events.

Daisy Chain. Linkage of master and slave scanners to allow data to be relayed up to the host via auxiliary port connections.

Decode. A good read. The successful scanning and decoding of the information encoded in symbol.

Default. Restores ROM or Flash settings, initializes serial commands and resets all counters.

Delimited. A command or field that is bracketed by pre-defined characters.

Decode Rate. The number of reads decoded per second by a scanner or 2D reader expressed in percentages.

Depth of Field. The distance between the minimum and maximum range in which a symbols have been read.

Discrete I/O. Inputs and outputs characterized by discrete signal transitions from one voltage level to another so that digital switching can occur.

Dynamic Setup. Testing and configuration done with symbols in motion.

EPROM. Erasable, programmable, read only memory.

Embedded Memory. Onboard memory device such as EPROM or flash.

End of Read Cycle. The time or condition at which the scanner stops expecting label information to decode.

Edge. Allows a read cycle to be initiated by a trigger signal from an object detector when it detects the appearance of an object (rising edge). The read cycle ends with a good read, a timeout, or a new trigger.

ESP. Easy Setup Program. A portable proprietary Windows/NT based program developed by Microscan Systems, Inc.

Falling Edge. A change of state (to inactive) associated with a level trigger in which the scanner stops searching for symbols. (See **Rising Edge**.)

Fixed Code Length. Increases data integrity by ensuring that only one label length will be accepted.

Flash Memory. Memory that can be changed by downloading new code and recalled on power up.

Focal Length. The distance measured from the scanner to the center of the depth of field, or *focal* point.

Focus. The point at which the tip of the scan beam is at its narrowest.

Full Duplex. Auxiliary port data is sent directly to the host but not displayed on the auxiliary port screen.

Gain. Optimal signal strength.

Good Match. The event occurring when a scanned label matches the master label information that is stored in the memory of the device.

Good Read. A decode. The successful scanning and decoding of the information encoded in a symbol.

Half Duplex. Auxiliary port data is sent directly to the host and displayed on the auxiliary port screen.

Host. A computer, PLC, or other device that is used to execute commands and process data and discrete signals.

Host Port. The pins or connections on a scanner or other device that physically connect with a host and—using the RS232, RS422, or RS485 standards—pass data and serial commands from one device to another.

Initialize. Implement serial configuration commands into the scanner's active memory.

Input. A channel or communications line. Decoded data or a discrete signal that is received by a device. See **Output.**

Intercharacter Delay. The time interval in milliseconds between individual characters transmitted from the scanner to the host.

Intercharacter Gap. The extra space between the last element of one character and the first element of the adjacent character of a specific bar code symbol.

IrDA. Infrared Data Association which promotes interoperable, infrared data interconnection standards.

Label Height. Regardless of orientation, the measurement taken along the length of a label's individual bars.

Label Length. Regardless of orientation, the measurement taken across the label's bars from one end to the other, including the quiet zone.

Label Speed. (LS) the distance per second that a symbol moves in a dynamic application.

Label Transitions. The transition of bars and spaces on a label, used to detect the presence of a label on an object.

Ladder Label Orientation. A bar code symbol in which the bars are parallel to the label's direction of travel.

Large Intercharacter Gap. Allows the scanner to read symbols with gaps between bar code characters that exceed three times (3x) the narrow element width.

Laser Framing. Setting scan width size by adjusting the on/off duration of the laser beam.

Laser On/Off. When enabled, the laser is ON only during the read cycle, provided the scanner is enabled for a Serial or External trigger.

LED. Light emitting diode.

Level. The condition in which a read cycle initiated by a trigger signal from an object detector remains active and ends when the object moves out of the detector's range.

Longitudinal Redundancy Check (LRC). An error-checking routine that verifies the accuracy of transmissions.

Master Label. A symbol or symbol data that is stored in a bar code scanner or 2D reader's memory and is compared with subsequently scanned symbols.

Master Scanner. First scanner in a daisy chain mode and linked directly to the host and in tandem to slave scanners.

Matchcode. The ability to compare symbol data being scanned against a master label that is stored in the memory of the scanner.

Embedded Menu. Configuration options embedded in the scanner's erasable memory.

ESP-MP Menu. Easy Setup Program—Multiple Platform. Configuration program that runs in Windows-based operating systems 95 and above.

Mil. One thousandths of an inch or 0.0254 mm. In bar-coding, a measurement standard that identifies a symbol by the width of its narrowest element.

Mismatch. An event that occurs when the scanned symbol does not match the master label that is stored in the memory of the scanner.

Multilabel. A scanner mode which allows a scanner to read more than one symbol in a single read cycle.

Multidrop. A communications protocol for networking two or more scanners or other devices with a concentrator (or controller) and characterized by the use of individual device addresses and the RS485 standard.

Narrow-bar-width. The width of the narrowest bar of a specific bar code label, expressed in thousands of an inch (or mils) as defined by standard code types.

Narrow Margins. Allows the scanner to read symbols with quiet zones less than 8 times the width of the narrow bar element.

Non-delimited. A command that is not bracketed by pre-defined characters.

Noread. A non-read. A condition that occurs when the scanner is set up to decode labels but no label is scanned during the read cycle.

Normally Closed. A discrete output state that is only active when open.

Normally Open. A discrete output state that is only active when closed.

NOVRAM. Non-volatile random access memory. Data that is saved for "power-on" is saved to NOVRAM.

Null. Also spelled Nul. A non-printed ASCII character that acts as a space-holder.

Number of Decodes. The number of times a symbol is scanned by the scanner during one pass through the laser beam.

Object Detector. A photo electric device used to sense the presence or absence of an object (also referred to as a package detector).

Output. A channel or communications line. Data or discrete signals that are transmitted or displayed by a device.

Output Format. The modification of data output according to a user-defined index of **Extraction** and **Insertion** commands.

Parity. An error detection routine in which one data bit in each character is set to 1 or 0 (zero) so that the total number of 1 bits in the data field is even or odd.

Picket Fence Label Orientation. A bar code symbol in which the bars are perpendicular to the label's direction of travel.

Pitch. Label (or scanner) rotation around the center of a line perpendicular to the label's bars.

Point-to-Point. A protocol consisting of a single communications event, typically used to connect a bar code scanner to a terminal or host computer.

Port. Logical circuit for data entry and exit. (One or more ports may be included within a single connector.)

Protocol. The rules for communication between devices, providing a means to control the orderly flow of information between linked devices.

Quiet Zones. Specified "clear" (non printed) areas immediately before and after the bar code symbol. The area is usually white (for black and white bar code) and at least 10 times the width of the narrowest bar, as measured in thousands of an inch. The zones can be other than white as long as their densities remain consistent and they have the required contrast relative to the bars.

RAM. (Random Access Memory) Memory that is lost after power is recycled to the unit.

Raster. Multiple, stacked scans produced by a separate oscillating mirror or by a spinning mirror with varying facet angles.

Read Cycle. A programmed period of time or condition during which the scanner will accept symbol input.

Reader. (1) Traditionally, a bar code device that can read but not decode bar codes. (2) Currently, a device that reads and decodes 2D matrix codes.

Read Range. The distances in which a label can be reliably read, as measured from the front of the scanner. See "Depth of Field."

Reed-Solomon Error Correction Code. A linear, error correcting block code, suited to the correction of character errors which could be, in bar or matrix codes, the obliteration or removal of part of the symbol.

Read Range. The distances in which a label can be reliably read, as measured from the front of the scanner. See "Depth of Field."

Relay. An electrical switch that allows a low power to control a higher one.

Reset. Sets all counters to zero.

Rising Edge. A change of state (to active) that initiates (and in some cases ends) a read cycle with a new trigger, an edge trigger, or the leading edge of a level trigger. (See **Falling Edge**.)

ROM. (Read Only Memory) Memory that cannot be changed.

Scanner. A scanning device that is comprised of a scan head and a decoder integrated in one package.

Scan Rate (SR) The number of decodes per second that a given scanner is capable of casting.

Scan Width (SW) is the width across the scan beam at a given distance from the scanner in which a label can be read.

Send. Transmit data from one device to another.

Separator. A character that separates data fields.

Serial Commands. Online data strings such as <D> or <P> sent from a host or auxiliary terminal to a scanner or other device.

Serial Configuration (Host Configuration). Serial command specifically for changing configuration and distinguished from operational command by the fact that they modify the non-volatile for power up configuration.

Skew. Label (or scanner) rotation around the center of the skew axis.

Slave Scanner. Linked to the master or preceding scanner in a daisy chain and relays symbol data to the host. See "Daisy Chain."

Specular Reflection. The direct, mirror-like reflection of light back to the source causing saturation and bad reads.

Supplemental. A character or data string that is appended to the main bar code symbol.

Symbol. A bar code. A decodable unit of information that is recognized by a bar code scanner.

Symbology. A code type, such as Code 39 or Code 128, with special rules to define the widths and positions of bars and spaces to represent specific numeric or alphanumeric information.

Tilt. Label (or scanner) rotation around the centerline of the scan beam.

Timeout. The termination of a read cycle or other routine by time.

Timeout Duration. The actual time that elapses during a read cycle or other timed routine.

Tracking. Adjustment of the precision of analog-to-digital conversion.

Transmit. Send or convey signals or information from one device to another.

Transparent. Data is passed between the auxiliary port and the host with keyed data echoed to the auxiliary port

Trigger. A signal, transition, or character string that initiates a read cycle.

Watchdog Timer. A security device that detects system crashes and attempts to reset the scanner.

Watchdog Reset. A reset that is forced whenever the software locks up.

Wild Card. User-defined character entered into a master label to permit matches with variable characters.

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